
# INVESTIGATING THE GREEN CONSTRUCTION:

# THE CONTRACTOR'S PERSPECTIVE

**Thesis**

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## STATEMENT OF AUTHENTIFICATION

Herewith I stated that this thesis has never been published in other institution and there were no part of this has been directly copied from published sources except citing from listed bibliographies attacthed.

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# ABSTRACT

Construction industries have contribution to the global warming because the activities of constructing buildings involve the usage of fossil fuels which emit a lot of toxic gases and harmful to humans and the environment. Furthermore, the buildings and projects constructed also contribute greatly to the global warming because these buildings need power, and most of them are powered by conventional power plants which use also highly polluting fossil fuels such as coal and oil. This mix of environmental impact from the actual building construction itself and from the operation of these buildings after construction is one of many human activities that lead to the emission of greenhouse gases, especially the carbon dioxide (CO2), The aim of this research is to investigate the contractors' understanding of green construction, In this research will be using the Questionnaires (primary data) as a method of collecting data. The best method and the easiest method as well to collecting data is questionnaire that will give accurate result during the analyzing of data, A quantitative analysis will be use for the questions and the comparison between five companies, Appropriate representations and tables are obtain to understanding analyze the quest are will be use to analyze questionnaires, The analysis date finally using descriptive methods for easy interpretation and to enable comparisons and inferences to be drawn. This chapter contains the results of data analysis obtained from the respondents' responses to the questionnaire sent to them. In total twenty five questionnaires were distributed to five respondents in each of the five construction companies surveyed in this study. Of the twenty five questionnaires sent, only twenty two were returned. For the final source of data only twenty one questionnaires were analyzed as one of them turned out to be sent by a drafter, which was not among the intended target respondents for this study due to the presumably lack of knowledge in the matters discussed in this study the contractors have heard about the green construction, so they have knowledge about that and they give many examples

# ABSTRACT

but they more educate to go more deeply about it can help them to know more about the benefits and  the other thing that related with this term.

In the different companies the contractors they mention many manners of policy that they followed such as reduce material which can damage environment, method of operation which doesn't disturb the natural balance. The contractors did many thing of the process about the materials, like how to recycle, reuse, renew and they handle the waste also it can make them go extremely toward the green construction term The contractors must increase their knowledge about the green construction. So it can help them to investigation the green construction in them companies. The government should support the green construction in each part of the country, and put the rules or policy that can be understood easier. To promote the green construction in the firms that apply the green construction should be given the incentives with various kinds to continue their green development.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

Construction industries have contribution to the global warming because the activities of constructing buildings involve the usage of fossil fuels which emit a lot of toxic gases and harmful to humans and the environment. Furthermore, the buildings and projects constructed also contribute greatly to the global warming because these buildings need power, and most of them are powered by conventional power plants which use also highly polluting fossil fuels such as coal and oil. This mix of environmental impact from the actual building construction itself and from the operation of these buildings after construction is one of many human activities that lead to the emission of greenhouse gases, especially the carbon dioxide (CO2).

The construction industry, however, can alleviate its carbon footprint by following several steps which include the design, construction process, maintenance and operation. Of these various steps through which the carbon footprint of a building can be reduced, this study focuses on the construction process. The concept of sustainable construction aims to minimize the environmental impact of construction process and maximize both economic viability and the social benefits (e.g. employment/ empowerment/ comfort/safety) of construction. The most important thing is to make sure that the buildings and the surrounding establishments are constructed in a way that is environmentally friendly and still retain all their comfort. This is to create an environment which is free from pollution and can protect the atmosphere to avoid global warming.

This effort requires contribution from all related parties in the construction industry, including the contractors, engineers, workers and so on, and also outside parties such as the government and the people in general. The

contractors can do their part in promoting the green construction concept in the construction process by following several steps such as making sure that the projects they are building have the highest energy efficiency possible and by implementing a more environmentally friendly approach in the construction process. The government, on the other hand can also support this green initiative by providing helps to the contractors in developing their projects with green concept in mind. The general public should also take part in green construction development because they are the end users of a construction project, and thus can have a voice also in determining the way the contractors build the project. After all it is in everybody's interest to reduce the impact of global warming due to the increase in the greenhouse gases emission to the Earth's atmosphere, as this phenomenon can have dangerous outcome to the environment.

This study targets the respondents working in various positions in the construction company, in relation to green building principle to know the extent of their knowledge about this concept, which they can apply in their work sites and to the city in which they live.

### 1.2 Aim and objectives

The aim of this research is to investigate the contractors' understanding of green construction, the objectives are:

1. To examine the knowledge of the contractors of green construction.
2. To identify the policy of the contractors in terms of green construction.
3. To recognize the contractors' application of green construction, including in the process of construction

### 1.3 Systematic of writing:

In accordance with the Master Program, the Proposal discussion system in this study is as follows:

Chapter 1 Introduction

This stage will elaborate on the background, purpose, goals objective and scope of study.

Chapter 2 Literature Review

This chapter contains the green building, pollution model, the factors causing damage to the occupants of buildings.

Chapter 3 Methodology

This chapter contains of the various approaches being taken to achieve goals and objectives included in the survey research, data processing, data analysis, and presentation of survey results.

Chapter 4 Schedule of planned research activities

This chapter contains a general strategy to be used in completing research on the preparation phase, data collection and analysis phase.

Chapter 5: discussion.

Chapter 6: Conclusion and recommendations.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Backgrounds

One important aspect of the green building includes the market for this type of structure. The demand has increased in the last decade and is expected to continue to do so. LEED (Leadership in Energy and Environmental Design) registered public sector green buildings have increased 10 percent while commercial buildings have increased 5 percent of the annual construction market. Jerry, Y (2008) LEED registered buildings are only part of the green construction movement.

There are a number of building councils, associations and government sponsored initiatives that support the construction of green buildings. Together an improved understanding of the green building and construction requirements are being formed. The literature search has only uncovered a fraction of available information that will better define and support the design and construction of a green building. The focus of the literature review at this point is to uncover the accepted definition of a green building and the most prevalent criterion used in the design and construction.

## 2.2 Current Issues Trends

### 2.2.1 Definition of green building

An important concept in this thesis approach is defining a green building. The California integrated waste management board defines a green building as, “a green building, also known as a sustainable building, is a structure that is designed, built, renovated, or reused in an ecological and resource-efficient. Green building is design to meet certain objectives such as protecting occupant health: improving employee productivity: using energy, water, and other resources more efficiently: and reducing the overall impact to the environment.” Jerry, Y (2008)

describes a green building as, "…..a high-performance property that considers and reduces its impact on the environment and human health. Jerry, Y (2008)" The Massachusetts technology collaborative renewable trust, defines a green building as, "….a building that has been constructed or renovated to incorporate design techniques, technologies, and materials that minimize its overall environmental impacts. (www.mtcp.org/cleanenergy/energy/glossaryefficiency.htm, 2008)

The definitions of a green building will sometimes include a description of a high-performance building. A high-performance building and there design are an all-inclusive philosophy taking into consideration the interaction of the whole building structure and Systems. (Michael, C, R, A 2000)

The green building council Indonesia has developed criteria for high-performance building and started a project called "commercial high-performance building," the goal is to apply design into construction principles.

The green building council Indonesia (GBCI) has a vested interest in green building just by the nature of its responsibility to protect the environment. This responsibility includes the support for the green building concept. The USEPA definition of a green building is:

"Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from sitting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high performance building."

"Green building is designed to reduce the overall impact of built environment on human health and the natural environment by:

•Efficiently using energy, water other resources

•Protecting occupant health and improving employee productivity

•Reducing waste, pollution and environmental degradation For example, green building may incorporate sustainable materials in their construction (e.g., reused, recycled-content, or made from renewable resources), create healthy indoor environments with minimal pollutants (e.g., reduced product emissions), and, reduced product emissions), and /or feature landscaping that reduces water usage (e.g., by using native plants that survive without extra watering (www.epa.gov/greenbuilding/pubs/about/htm 2008)

### 2.2.2 Building Councils

There is a number of building councils and associations across the United States. The main focus of this thesis is the study of available information as it pertains to the criteria used in the construction of an office building and the sing-family home. The literature search has lead to two significant. The green building council and the national association of home building is the central focus of the literature review.

#### 2.2.2.1 The Green Building Council and LEED

The United States green building council (USGBC) was founded in 1993 for the main purpose of driving the change of sustainability in the construction of building. Originally USGBC was organized as a committee of like-minded people coming together to from a consensus on the creation of sustainable building. The committee recognized the need to educate member of their own profession on how to create a sustainable building. The ultimate goal of LEED"s was to impact a market transformation. In 2000, LEED was launched. LEED encourages adoption of sustainable green building and development practices. The LEED creators understood that for a green building to become viable, their clients would have to understand what advantages building green would have for them in terms of life-cycle costs, productivity increases and the ability to market the building. (Greensource Magazine 2008) This is accomplished through implementation of tools and performance criteria. LEED is a certification program that has become nationally accepted as a way to prove a building is green.

The reason for wanting a green building was discussed in the previous section.

Rating system programs have been developed by the different types of building, figure 2.1, each with their own criterion.


Figure 2.1 LEED Rating System That Have Been Developed (Zigenfus2008)

Each program rating system has an individual checklists and USGBC certification. These include:

- New construction-designed to guide and distinguishes high-performance commercial and institutional projects.
- Existing building-provides a benchmark for building owners and operators to measure operations, improvements and maintenance.
- Commercial interiors-is a benchmark for the tenant improvement market that gives the power to make sustainable choices to tenants and designers.
- Core and shell-aids design, builders, developers and new building owners in implementing sustainable design for new core and shell construction
- Schools- recognizes the unique nature of the design and construction of k-12

- Schools and addresses the specific needs of school spaces.
- Retail-recognizes the unique nature of retail design and construction project and addresses the specific need of retail space.
- Healthcare-promotes sustainable planning, design and construction for high-performance healthcare facilities.
- Homes-promotes design and construction of high-performance green homes.
- Neighborhood development-integrates the principles of smart growth, urbanism and green building.

To receive a LEED certification a building must meet the criteria for that particular type of structure in the appropriate program. This thesis will discuss the LEED programs for new construction and homes. As previously stated, the original program started by LEED-NC in 2000 was for new construction new construction program guidelines cover six categories:

- Sustainable sites-reduce pollution from construction activity, avoid development of inappropriate sites and reduce the environmental impact of the location on the building at the site. Sustainable can be in reference to alternative transportation, impact from light pollution and heat island effect.
- Water efficiency-limit or eliminate the use of potable water, or other natural surface or subsurface water resources available on or near the site, for landscaping, and innovation in the use of wastewater technologies, and other use reduction.
- Energy and atmosphere- verify that the energy related systems are installed, and performing according to the project design, establishment of energy efficiency, reduce ozone depletion, increase use of renewable energy, provide for ongoing accountability of energy consumption over time and encourage development of renewable energy technologies on a near zero pollution basis.

- Materials and resources-storage and collection of recyclables by the occupant, divert construction waste material from landfill disposal, use of existing building materials, use of local and recycled(pre and post consumer) materials, reduce or not use finite raw materials in the construction material of the building and encourage environmentally responsible forest management.
- Indoor environmental quality-establishment of indoor air quality performance as it pertains to the comfort and well-being of the occupants from any hazardous particles or chemical pollution, or biological impact. Provide lighting. Heating and cooling comfort for the occupants.
- Innovation and design process- encourage for design and implementation of components that go above the minimum LEED requirements.

LEED uses a point based-rating system. Points are given for each criterion that has been met. Each of the six categories in the new-construction program has sub-categories that are assigned points adding to possible score of up to 69 points. LEED then adds the points and issues a rating level. The rating system for new construction is:

- Certified- the project scored 26 to 32 points of the core points.
- Silver rating- the project scored 33 to 38 points.
- Gold rating- project score 39 to 51 points.
- Platinum rating- the project score more than 69 points.

Earning points for any of the programs is accomplished by meeting the criterion established for the particular category within the given program. An example of the points system is the sustainable sites category for new construction. In this category, there are eight credits one prerequisite. The prerequisite must be met before a building can be certified. The prerequisite, for construction-activity pollution prevention, is required in order to even consider certifying a building under the LEED program. The reason for this prerequisite is to ensure that construction waste, erosion, and runoff do not contaminate adjacent

sites or the overall environment. Points are not given for meeting a prerequisite. The points in the sustainable-sites category include alternative transportation (such as access to public transportation), Brownfield redevelopment (cleaning up a contaminated site, as opposed to using a "Greenfield," which has never been built on), light pollution reduction, and mitigation of the heat- island effect. (Greensource Magazine, 2008)

Other credits work in a similar way. For example, water-efficiency credits look at ways to handle wastewater, the reduction of irrigation for landscaping, and waste-use reduction. Energy and atmosphere requires some fundamental building commissioning. Minimum energy performance and reduction of chlorofluorocarbons in mechanical system, but it also encourages the use of renewable-energy strategies. (www.usgbc.org/DisplayPage.aspx?CMSIS=222, 2008)

The LEED home program measures overall performance in eight categories:

Innovation and design process-special design method, unique regional credits, measures not currently addressed in the rating system and exemplary performance levels.

- Location and linkages- the placement of homes in socially and environmentally responsible ways in relation to the larger community.
- Sustainable site- the use of the entire property so as to minimize the project's impact on the site.
- Water efficiency- water-efficient practices, both indoor and outdoor.
- Energy and atmosphere-energy efficiency, particularly in the building envelope and heating and cooling design.
- Material and resources-efficient utilization of materials, selection of environmentally preferable materials, and minimization of waste during construction.
- Indoor environmental quality-improvement of indoor air quality by reducing the creation of and exposure to pollutions.

- Awareness and education- the education of homeowners, tenant, and/or building manager about the operation and maintenance of the green features of a LEED home.

The rating system for LEED home construction is:

- Certified- the project score 45 to 59 points of the core points.
- Silver rating- the project score 60 to 74 points.
- Gold rating- the project score 90 to 136 points.
- Platinum rating score more than 136 points.

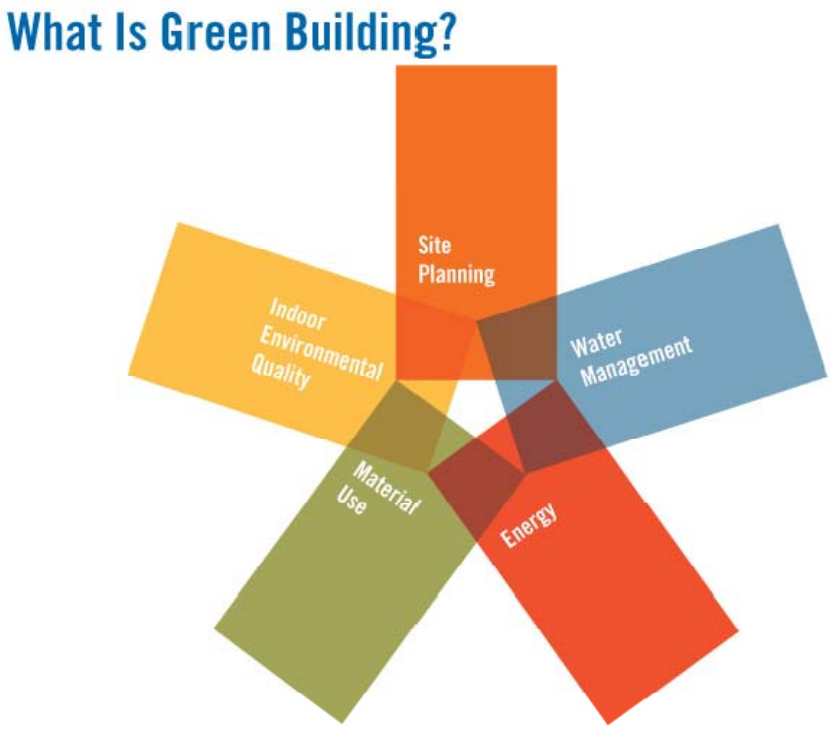
LEED for homes allow home size adjustments based on the square footage. This also allow for larger homes and multi-family units that use more resources. Like the LEED new construction, the home program does have prerequisite. In the sustainable sites category prerequisite are required for erosion control during construction. For example, there is a specific list of specific erosion control measure that must be met:

a. Stockpile and protect disturbed topsoil for possible reuse.
b. Control the path and velocity of runoff with silt fencing.
c. Protect on-site storm sewer inlets, streams, and lakes with straw bales, silt fencing, silt sacks, rock filters, or comparable measures.
d. Protect swales to divert surface water from hillsides.
e. If soils in sloped area are disturbed during construction, use ties or a comparable approach to stabilize the soil.
f. Another sustainable site prerequisite includes no invasive plant species can be introduced into the landscaping.

There are no prerequisite for water efficiency, however energy and atmosphere category must meet the performance of energy STAR for homes, including third party inspection. Other energy and atmosphere prerequisite include requirement for: basic insulation, reduced envelope leakage, window design and

installation, heating and cooling system, lighting, and residential refrigeration. (Green Building Council 2007)

The USGBC define green (see figure 3) as a "high performance building that's energy and water efficient, has good indoor air quality, uses environmentally sustainable materials and also uses the building lot or site in a sustainable manner." (www.healthy-holistic-living.com, 2008)




This graphic describes the LEED definition of a green home very well and is taken from the U. S. green building council web site located at (Zigenfus2008)

### 2.2.2.2 National Association of Home Builders

The national home builders association (NAHB) was founded in 1942 and is a federation of more than 800 state and local association.

(www.nahb.org/page.aspx/generic/sectionID=89/print=true, 2008)The mission of NAHB is to enhance the climate for housing and the building industry. One of the chief goals is proving and expanding opportunities for all consumers to have safe, decent and affordable housing. The NAHB serves a number of different functions within the organization including influencing legislation, public education and building criteria among other.

The NAHB has developed program called. NAHB MODEL GREEN HOME BUILDING GUIDELINES. The guidelines were designed with the home builder in mind. As stated in the introduction, "the main purpose of the guidelines is to highlight ways in which the mainstream home builder can effectively and holistically weave environmental concerns into a new home and to provide a tool for local associations to create a green home building program." The guidelines list guiding principles that are to be taken under consideration when building a green home: (NAHB, 2006)

1. Lot design, preparation, and development- even before the foundation is poured, careful planning can reduce the home's impact on natural features such as vegetation and soil, and enhance the home' long-term performance. Such preparation can provide significant value to the homeowner, the environment, and the community. These reduce environmental impacts and improve energy performance of home. As an example saving trees already on-site and to maximize passive solar heating and cooling are basic processes used in the design construction of green homes.
2. Resource efficiency- construction of the environment in the design phase- the time, at which material selection of occurs, leads to a more successful green home. Advanced framing techniques and home design can effectively optimize the use of building materials. Creating resource efficient design and of efficient material can maximize function of the home while optimizing the use of natural resources. For example engineered wood products can optimize resources by using materials in

which more than 50% more of the log converted into structural lumber, thereby reducing the need for recourses.

3. Energy efficiency- minimizing the environmental impacts of energy used in the construction, operation of the home and in the making of the construction materials.
4. Water efficiency- the implementation of water conservation measures that will reduce the impact on natural water recourses, storm water and wastewater treatment.
5. Indoor environmental quality- creation of healthy and safe indoor air is important in a green building. Indoor air quality is often cited as the second most important feature of a green home after energy use. More important attention is being paid to the type of building material used and the potential impact to the occupants of the home.
6. Operation, maintenance and homeowner education- improper maintenance can defeat the efforts to create a resource efficient home. As an example a home owner may fail to change air filters regularly or not operate kitchen or bathroom exhaust air to remove excess moist air. These impacts the air quality of the home and excess moisture can create mold that can impact the health of the occupants.

   An education program that provides information to the homeowner on how to maintain and operate a green home is provided. A manual on how to optimally operate and maintain the house is provided to the homeowner.

7 Global impact- this guiding principle does not fit neatly into the context of green home building but has global impact. By-products from the construction and operation of the green home such as volatile organic compounds can have an impact on ozone. This is a global issue not just confined to the community.

8 Site planning and land development- consideration to the entire community and existing infrastructure in addition to the individual building can amplify the benefits of green home building. As an example

the improvement of a subdivision's storm water management plan and preserving the available natural surroundings through careful design and construction. Can impact the entire community and reduce infrastructure costs.

There are three levels for builders to rate their projects: bronze, silver or gold. Points are assigned for each line item on a checklist that meets the established criteria. The higher the rating the more green the home. There are seven guiding principles that are used to ensure that all aspects of green building are addressed and that there is a balance with whole house approach. The point system used by the NAHB as shown in table 2.1 (www.nahbgreen.org/Guidelines/default.aspx, 2008)

**Table 2.1 Green Building Guidelines Overview NAHB (2006)**

| | Bronze | Silver | Gold |
|---|---|---|---|
| Lot Design, Preparation, and Development | 8 | 10 | 12 |
| Resource Efficiency | 44 | 60 | 77 |
| Energy Efficiency | 37 | 62 | 100 |
| Water Efficiency | 6 | 13 | 19 |
| Indoor Environmental Quality | 32 | 54 | 72 |
| Operation, Maintenance, and Homeowner Education | 7 | 7 | 9 |
| Global Impact | 3 | 5 | 6 |
| Additional points from sections of your choice | 100 | 100 | 100 |

### 2.2.3 Earth Craft House Program

The earth craft house program is a voluntary green building program and serves the southeast region of the United States. In 1999, the greater Atlanta homebuilders association and the south face energy institute came together and created the earth craft housing program. In 2004, the earth craft program

expanded and covers much of the southeast to include Alabama, South Carolina, Georgia, Tennessee, and Virginia. Earth craft certifies both sing-family and multi-family homes through an approval process. A builder must first complete a worksheet to show that the home will score enough points to qualify for the certification. The house is then inspected and tested by earth craft using an independent third party.

To become earth craft house certified a house must score a minimum of 150 points on the scoring worksheet. There are separate worksheets used for scoring single-family homes. And home renovation. The worksheet lists the required criteria and the points that each is worth. in addition to the point requirement each house must have plans on orientation, meet ENERGY STAR certification criteria, have a per-drywall inspection by an earth craft house inspector, and pass a final inspection by earth craft. Select and premium status are awarded to homes that meet additional criteria and achieve 200 and 230 points. All earth craft certified homes are also awarded energy star certification. Points can be earned in ten different categories: (EarthCraft House 2005)

1. Site planning- includes an erosion control plan, tree preservation plan (builder must participate in the building with trees program), and when possible a wildlife habitat area.
2. Energy efficient building envelope and system- consist of a thermal barrier and an air barrier. The home must meet the requirement and become compliant with the requirement of the energy star guidelines as set forth by the U .S environmental protection agency.
3. Resource efficient design- framing design must comply with local building codes.
4. Resource efficient building material- construct the house from at least 50% lumber that meets the criteria of sustainable harvesting as set forth by the forestry stewardship council (FSC). Requirements for engineered floor framing, recycled content of outdoor structures must be at least 40%,

singles and exterior roofing must have a minimum 25-years manufactures warranty.

5. Waste management- no construction materials shall be burned or buried on the job site or other area except state approved construction and demolition landfill. A construction was management plan must be submitted. A minimum of 75% recycling is required including wood product.
6. Indoor air quality- all combustion units must be vented, moisture control is required for the construction materials such as plastic footing wraps. Bathroom and dryer venting is required, as is a passive radon vent system, and urea-formaldehyde is not allowed in any construction materials.
7. Water construction (indoor and outdoor) - all fixtures will meet the national energy policy act low flow standards. Each home will comply with the water smart program for example a greater irrigation plan and a rainwater harvest system will be included.
8. Homeowner education- the builder must provide a manual and review with the homeowner the features of the green home.
9. Builder operations- these are builder only requirements, but include an agreement to build and certify one earth craft house every year.
10. Innovation points- this category allows for bonus points if certain criteria are met. Such as locating the home within 0.25 miles of mass transit, plant or preserve street trees every 40 feet or installation of a solar electric system

### 2.2.4 Green Building Council Indonesia; Promoting Sustainable Building Concept In The Archipelago

In Indonesia, the national development performance targets for Sustainable Buildings developed by Green Building Council Indonesia (GBCI), a non-for-profit organization with a mission to support, promote and maintain the

goal of market transformation, changing industry and public behavior, creating a forum and dialogue, build community and expertise in building and environmentally friendly construction. They legally authorized and cooperated with the Ministry of Environments (KLH) which do the research activities with all aspect of management of natural resources, conduct the environmental impact assessment, environmental management and laws, conservation of coastal beaches and waters, control pollution, waste treatment technology, environmental health and another. For supporting the targets, recently they authorized the criteria and green building certification. The government should encourage and facilitate initiative of the stakeholders in implementing mitigation and adaptation climate change through the management-friendly building environment. The perceived barriers of this government agency is still biased in laws and regulations which are made of green building regulations to serve as guidelines in building the future, because the legislation base of less powerful in determining the domain of green building terms. Their understanding was often separated from "Green Building" in its implementation, while another one has a close relationship to answer the challenges faced. On the other hand, in recent years the Ministry of Environment (KLH) seeks to promote Sustainable City as a place of establishment of Sustainable Building, through *"Program Bangun Praja"* which aims to improve performance in environmental management, and better encourage other regions outside the capital to join apply with fixed focus in creating Sustainable City in its infancy, covering up the management of the building footing and green open space (including shade), the management of public facilities, pollution control and waste water.

The second government agency involved to determine the performance target was The Ministry of Public Works (PU) as government-related elements that always made resources, such as from Directorate of Technical Planning and Settlement Development, Directorate General *"Cipta Karya"* and Directorate Development and Restructuring Settlements. The Ministry of Public Works commits to support the issues which will build their new Directorate General of

Water Resources (SDA)'s building in their complex. The 8th (eight) floor of the building is targeted to be completed by the end of 2010. This building will use the concept of Green Building energy efficient. Architecture of this building will be getting tropical-style lighting and natural ventilation very possible without the Air Conditioner. This building will also use the recycle water where there will be many pond or rain water capacities even in the 3rd floor which created the park in addition to socialization, to relax but also serves to bin water. In general, the interior is made from recycle materials that reflect sustainable architecture. The Minister hoped that this building can be a *"Pilot-Project"* building in terms of energy, simplicity, effectiveness and flexibility, even for people who have physical disorders such as blind people. In terms of energy saving and office-room sharing must follow the requirements of new and in accordance with the new rules. According to *Mr. Achmad Noerzaman* Director from *PT. Arkonin*, the architecture consultant said the modern building is based on the principles of sustainable architecture or green architecture by inserting the nature theme, incorporating natural elements such as air as possible, and by extending the natural landscape garden in the building. This building will broadcast 20% without air-conditioning at a given time can be used without air-conditioning and enough air to get well, but the risk is the problem of pollution, noise and dust the way of overcoming it is to reproduce the green elements as possible, although not optimal but can be cultivated office operation. The air-conditioning can be used only for 5-7 hours with automation system; we hope this building can save 15-20% because designing a quantitative area 20% with no air conditioning. Thus also reproduce the surface rain water reservoir, using catchment, drainage of rainwater reply was not discarded but direct-use.

According to the Director General of Water Resources (SDA), Ministry of Public Works (PU), *Mr. Iwan Nursyirwan*, actually the idea of this building has long master plan around 2003. The new concept of green building to save electricity is good lighting so as not to require a lot of lights and lots of open space and air-conditioning can be reduced as the elevator corridor and have

applied all the existing "*Building of Action"* for people with disabilities, the blind and fire facilities.

Together, Regional Development Agencies revise the law on regulation of building construction activities from design stage through to implementation on site towards the friendly environment. Continually improving the RUTR (general plan spatial) and RTDR (spatial details of the plan) for the management of land use and structure for more optimal space, more effective policies and local initiatives to reduce disparities/administration direct to ecologically-based planning. The approach taken in planning can be:

- Administrative: An approach based on the laws / regulations
- Technical: The balance between waking and natural on the development footprint special treatment (hazard) in the damaged area with consideration of ecological, economic and aesthetic

Regional development of performance targets are also monitored by the Ministry of Energy and Natural Resources (ESDM), in making regulations for the building efficiency levels that will be applied as building-database-system to create the index for some typical types of buildings according to locality, continuing to dissemination to the general public and relevant agencies to promote public awareness that can enhance the level of awareness of energy efficiency in industry and construction planning. Things that must have to do is cooperate with the Directorate General of Taxes of Republic Indonesia and Ministry of Finance active in providing incentives and disincentives in the form of ease of procedure and the tax rate policy.

In related to energy efficiency in Sustainable Building, in some cases, the simple incentives scheme can be shown from the cooperation the tenant of building (private or public) with the landlord (the government) to share the cost of their building operations, installations, replacement and maintenance. The recovery of cost is really proposition even accounting for tenant turnover and depreciation. Because it makes the landlord responsible for capital investment and

might be can give the benchmark of energy use for the building toward reducing the use of the non-renewable resource. With the requirement, they must agree to the following provision governing rules.

Some of the adoption of Sustainable Development techniques shown at the creating of Eco-City in Indonesia, Sentul City, West Java for instance. They order to navigate the developing and build the city more comprehensive and rapid in accordance to the today's demands and the future. Their development focus on making the green implementation that matches on local weather and regional potential to harmony the nature. To have a conception of nature that it can minimize the negative side effects caused by the actual building of its physique. Cultural and heritage aspects are also serve a consideration in the development of the Sentul City beside their entertainment attraction and tourism destination.

### 2.2.5 Waduk Jati Barang' Project, Semarang

Jatibarang dam project has been considered as one of the best sustainable building in Semarang, Indonesia. Jatibarang Reservoir has been a long-awaited community of Semarang. Meanwhile, construction starts from the disastrous floods in 1973, 1988, 1990and 1993. In fact, catastrophic floods in the 1990 casualties by 47 people. The main dam can not be built because the water was still full. The City Government (City Government) Semarang initiate immediate planning in anticipation of flooding through Kreo Kali, Kali Garang and Banjirkanal West. After going through a review in 2008, then 2009 to the beginning of the introduction Jatibarang Reservoir. The flow of river water is then directed to a tunnel 421 meters long dodger with a horseshoe shape 5.6 meters in diameter. The dodger tunnel equipped with 20-ton door is able to dishchargeas water as much as 280 cubic meters / sec. About the benefits of dam construction will be able to control floods with discharges 230 cubic meters / sec.

Meanwhile, the reservoir is not just for flood control, but has multifunctional benefits.

Figure 2.2 Waduk Jatibarang' Project, Semarang

It can also be used to meet the needs of water supply, electricity supply and tourism potential. It also can provide electrical energy with a capacity of 1.5 megawatts and increase the potential for tourism. Overall progress Jatibarang Reservoir has reached 26.36 percent. Where, the construction of the tunnel dodger completed 100 percent, building spillway water or 30 percent, while 60 percent of roads and office building while 100 percent. In construction, the reservoir has been synergy ized with normalization Banjirkanal West to overcome the flood disaster.

This project also applies the principle of green construction in the building during the construction process of this project. It used the machines to produce cement at the location so they did not need to bring cement from outside the site. They also use the excavated soil from the site, such as shown in the picture above in the mix concrete used in the construction of the dam.

This indicates the keenness of the staff or engineers to apply the principle of building green during the construction process. There is another example as well, the area above the dam is a habitat of monkeys. So the staff planted a lot of banana trees on the construction site to reduce the harassment of monkeys for workers course of their work.

Figure 2.3 Canal Jati Barang Project.

And since the project is next to the river, the engineers take benefit from the use of water as a source of energy in the workplace. It also allows the staff to focus on the Safety Act in the location where they commit to follow the law of workers' safety at the site.

Figure 2.4 The Meeting Room In Jatibarang Dam Project, Semarang.

As the picture showed the windows in this room in close and they use the air-conditioned at day although the location of this room or this project is in

gunung pati , this area is cool usually so the owner doesn’t aware about the green construction when this building under presses

# CHAPTER 3
# RESEARCH METHOD

This chapter discusses the methodology used in this research. The methodology in this research includes information about the research strategy, research design, data collection, questionnaire design, questionnaire content, pilot study and the method of processing and analyzing the data.

## 3.1 Research Methodology

Research strategy can be defined as the method in which the research objectives can be questioned in this research; a quantitative approach is selected to understand the perception of construction professionals in Indonesia toward green building and the demand to promote green building performance in construction site in Indonesia.

## 3.2 Research Design

This study used the descriptive method of research. The descriptive method describes the data and characteristics about what is being studied. For this study descriptive method was used to measure the relationship between five construction companies and green construction. The questions used in this research were simple questions designed to be easily understood by the respondents.

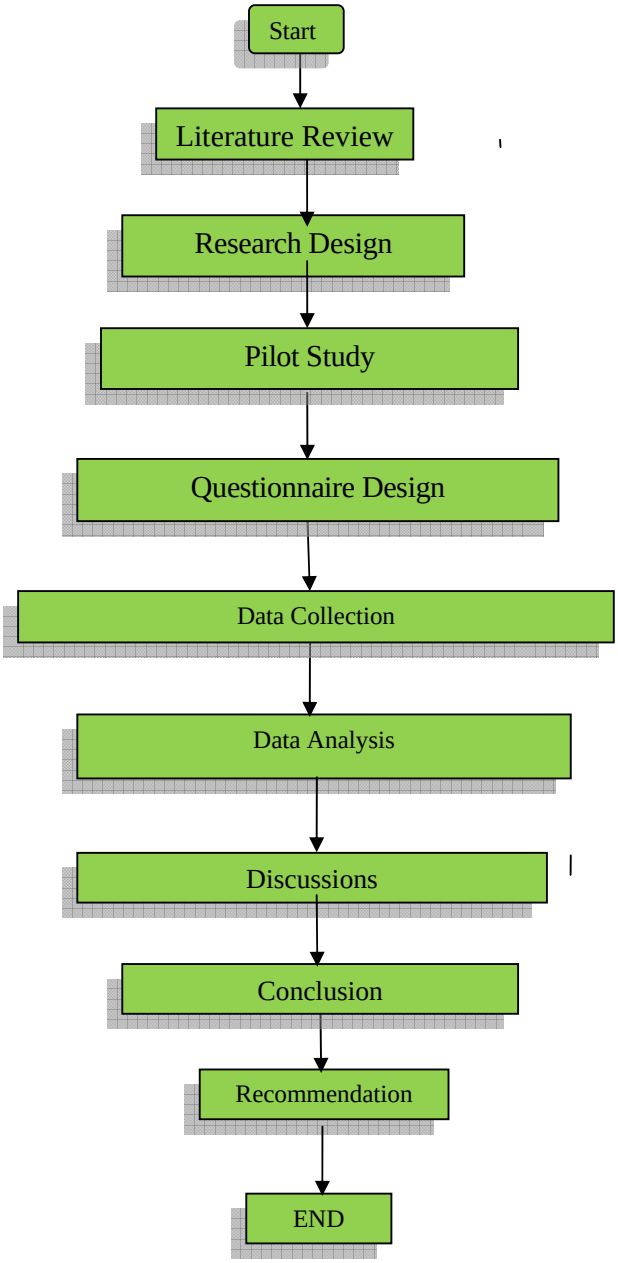



**Figure 3.1 Flow Chart of Methodology**

## 3.3 Data Collection

In this research questionnaires (primary data) was used as the method to collect the data. The questionnaire method was chosen because the method was considered as the best and easiest method to collecting the data needed for this research. Through the use of questionnaire accurate information can be readily obtained for analysis.

## 3.4 Questionnaire Design

The first draft of the questionnaire was developed on the basis of a review of the literature and questionnaire regarding the green building investigation and promotion. Some questions were also quoted from this questionnaire. Modifications and new questions were then added to suit the local construction industry in Indonesia. The content of the draft questionnaire were also discussed with the contractors

## 3.5 Pilot Study

Before being distributed to all respondents, the questionnaires were at first distributed to the five companies so that the contents can be examined. The examinations were conducted by the experienced people working for the five contractors. All of them said that the questionnaire was very good to be used to understand the current implementation of the green building concept in the construction site. Afterwards the questionnaires were then directed to five respondents in each of the five construction firms.

## 3.6 Data Analysis

After the data were obtained and edited, data analysis was then undertaken. The analysis is the process to interpret the data that have been collected about the subjects so that they can be understood in accordance with their context. Quantitative analysis was used for analyzing the questions and comparing the standing of the five companies on this issue. Appropriate representations and tables were drawn to group the questionnaires based on their respective companies.

## 3.7 Questionnaire Content

The questionnaire aimed to investigating the green construction in Indonesia and knows the understanding of the contractor's. The questionnaire was divided into four major parts as follow:

- The first part focuses on the knowledge of green construction
- The second part focuses on the policy of green construction.
- The third part focuses on the application of green construction.
- The fourth part focuses on the process of green construction.

# CHAPTER 4

# RESULTS

This chapter contains the results of data analysis obtained from the respondents' responses to the questionnaire sent to them. In total twenty five questionnaires were distributed to five respondents in each of the five construction companies surveyed in this study. Of the twenty five questionnaires sent, only twenty two were returned. For the final source of data only twenty one questionnaires were analyzed as one of them turned out to be sent by a drafter, which was not among the intended target respondents for this study due to the presumably lack of knowledge in the matters discussed in this study.

## 4.1 Profile of Respondents

This section describes the job title of respondents and their years of experience in their respective companies. The respondents held many different positions with a varying degree of experience. There were eight different positions held by the respondents taken part in this study. The position with the highest number of respondents was site engineering manager (with 9 people), followed by supervisor (3 people), engineer (2 people) and occupational health/environmental quality (2 people). The other four positions, namely: project manager, marketing, quality control and manager were held by only one respondent respectively (figure 4.1).

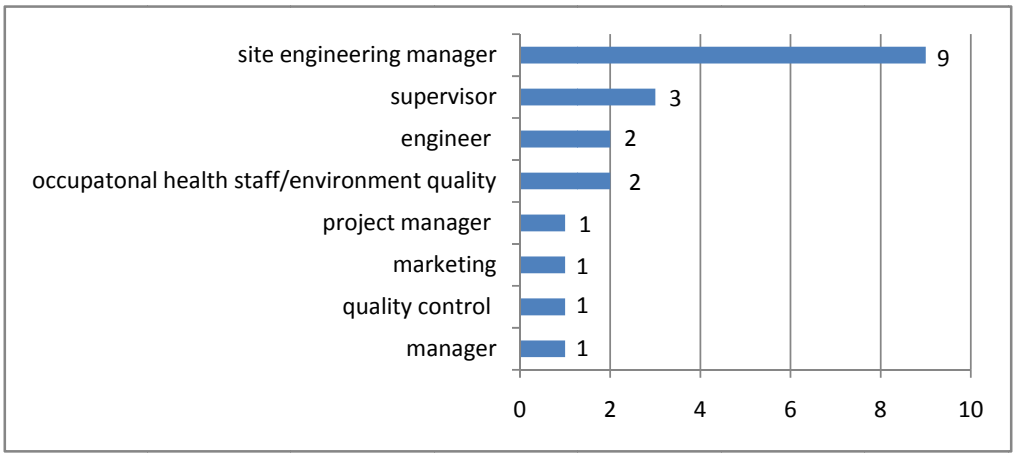



**Figure 4.1** Respondents' position in the company

### 4.1.1 Respondents' Years of Experience

As can be seen in the following figure, three quarters of the respondents had only less than five years of experience in the company (55%). I5% of respondents had experience of more than ten years, while the other 10% had between 5 and 10 years of experience in the company.

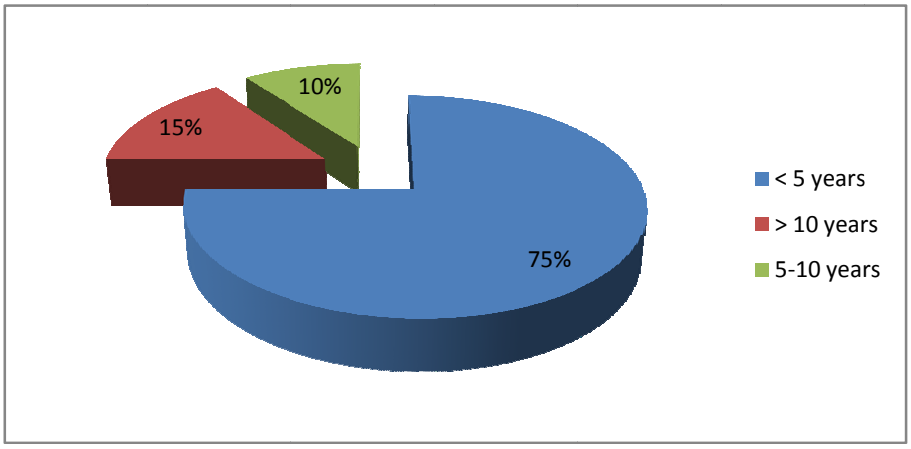



**Figure 4.2** Respondents' Years Of Experience

## 4.2 Knowledge of Green Construction

In this section, seven questions, ranging from the definition of green construction to obstacles in promoting green construction in the project, were asked to evaluate the knowledge of the green construction concept within each company. The results are as follows:

### 4.2.1 Awareness of the Green Construction

Respondents form each of the contactor surveyed in this study were asked whether they have heard about the green construction concept. The responses obtained from these respondents were needed to know about the awareness of the green construction concept within each of these contractors. The results are shown in the table below.

**Table 4.1** Contractors' Awareness of the Green Construction

| Company | Response |
|---|---|
| Wijaya Karya | All respondents in this company had the knowledge about green building. One of them even gave an example of a green construction concept in building construction. |
| Pembangunan Perumahan | The majority of respondents said that they have heard about green construction. They gave examples such as changing common construction material, i.e. wood with the other materials like steel pipes or fiber plastic and figuring out how to save energy during construction. |
| Hutama Karya | Two of the respondents said that they were not aware of green construction concept, but the others were aware of it. There are simple things that can be done to protect the environment, such as saving energy in the building by turning off light or air conditioner when not in use. |
| Waskita Karya | All respondents said that they have heard about green building concept. Examples of this concept are the creation of open space, parks and garden in home and building; construction management without causing negative effects on the environment, building garden in the roof top and minimizing the use of air conditioner. |
| Adi Karya | The majority of the respondents said that they have heard about the green construction. They gave examples such as building permanent construction with the advanced green atmosphere and the development of city parks. |

The respondents in all five firms have heard about the green construction. They gave many examples, such as the construction of permanent building with the advanced green atmosphere, the development of city parks, open space, residential parks and the creation of garden at the yard or on the roof top of homes and other buildings. Green practices can be implemented in construction management which does not cause negative effects on the environment, in simple practices such as turning off light or air conditioner when not in use to save energy, and replacing common construction material, i.e. wood with the other materials which are more environmentally friendly such as steel pipes or fiber plastic.

### 4.2.2 The Definition of Green Construction

Respondents form each of the contactor surveyed in this study were asked about the definition of the green construction. The responses obtained from these respondents were needed to know how green construction concept was defined in these respective organizations. The results are shown in the table below.

**Table 4.2** Contractors' definition of the green construction.

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents in this company defined the green construction as a structure built using processes that are environmentally responsible that is resource-efficient throughout its life-cycle. This building must use efficient energy, materials, waste management and product to improve their process for more sustainable environmental in the future. Building green is an opportunity for the contractor to use resources efficiently while creating healthier building. |
| Pembangunan Perumahan | Respondents gave different definitions for green construction. In their view green building means the building construction that uses less energy, conserves renewable resources and reduces the usage of toxic material. On the other hand green construction can be defined as building something with environmental mind set to reduce air and water pollution and keep sustainability of trees and soil etc. |
| Hutama Karya | Two of the respondents could not give definition, but the others gave different definitions by saying that green construction means constructing buildings that do not pollute the environment to save earth, or preventing damage to the environment during construction period. |
| Waskita Karya | All respondents gave their definition of green construction. Green construction is construction with environmentally friendly concept and application. This kind of construction ought to use materials that can be recycled to minimize energy usage and provide added value to the area with sound functions and benefits. |
| Adi Karya | The respondents gave different answers. Some said that green construction is construction aimed at conserving the environment while also focusing on its beauty and comfort value. Any green development should allocate at least a quarter of its area for green space. Green construction also cannot damage the surrounding environment. |

The respondents in all five firms also gave definition for green construction. Green construction is construction which also conserves the environment and focuses on the beauty and comfort. Any development which can be considered as green should have at least a quarter of its area for greening. Construction with the green concept applies the environmentally friendly method and provides many functions and benefits as the added value for the area of construction. Green construction also means using material that can be recycled, minimizing energy usage, conserving renewable resources and reducing toxic material used. In green construction, projects are always built with environmental mind set to reduce water and air pollution and keep the sustainability of trees, soil etc. it uses the structure and processes that are environmentally responsible throughout the building life-cycle and energy efficient. Constructors must improve their process for more sustainable environmental in the future. Going green is an opportunity to use resources efficiently while creating healthier building.

### 4.2.3 The Benefits of Green Construction

Respondents form each of the contactor surveyed in this study were asked about the benefit that can be created from green construction. The responses obtained from these respondents show that these contractors viewed that green construction can bring several benefits from lowering the budget of construction process to keeping the environment clean. The complete results are shown in the table below.

**Table 4.3** Benefits of the Green Construction.

| Company | Response |
|---|---|
| Wijaya Karya | For this question the respondents in this company gave different answers. They viewed that green construction can bring benefits such as improving the quality of the product and lowering the budget of construction process through more efficient usage of water, material and energy. |
| Pembangunan Perumahan | Strategically, the green construction can improve energy efficiency that in turn will reduce cost and health risk. |
| Hutama Karya | Different answers were given by respondents in this company. The benefits they mentioned were better energy efficiency, environmental consideration, more balanced environment and ecosystem. |
| Waskita Karya | Respondents in this company also mentioned many different benefits such as green construction can preserve the nature, reduce global warming, reduce air pollution, provide beautiful view, provide space for recreation, give more care to the environment, create less damage, and maintain environmental sustainability. |
| Adi Karya | Green construction can keep the environment clean and cool and reduce air pollution. Moreover it does not damage the surrounding environment and bring positive impact on the beauty and comfort of the surroundings. |

Respondents in the five firms mentioned several benefits. Green construction can improve the quality of the product and lower the budget of construction process, increase water, material and energy efficiency; reduce the cost and health risk. It can also create a balanced environment and ecosystem, preserve the nature, reduce global warming effect and air pollution, provide beautiful view, space for recreation, more care to environment, create less damage and maintain the environmental sustainability. All these positive impact on the environment created by keeping the environment clean and cool without any damage to the surrounding will add to the beauty and comfort of the people.

### 4.2.4 Ways to Promote Green Construction

Respondents in these different companies were asked to mention the ways to promote the green construction. The ways these contractors promoted the green construction varied from reducing material that can damage the environment to planting trees at the project site. The complete responses representing each of the companies are shown in the next table.

**Table 4.4** Ways to promote the green construction.

| Company | Response |
|---|---|
| Wijaya Karya | Most of the staff in this company said that green construction can be promoted through reducing material that can damage the environment and using method of operation which does not disturb the natural balance. One of them said that it can be done by minimizing waste and using recycled products which include lumber, dry well, metals, masonry (brick, concrete, etc), carpet, plastic, pipe, rocks, paper, cardboard, as well as taking good care of the waste during land development. |
| Pembangunan Perumahan | Some of the respondents said that it can be done in a simple way such as planting some trees around project sites. and implementing the company's environmental standards in the projects. |
| Hutama Karya | Three of the staff gave different answers such as turning off the light when not in use, disposing waste in its proper place and using construction method that does not destroy the environment to save Earth. |
| Waskita Karya | All of the respondents said that promotion can be done by using material that can be recycled, saving the energy usage, planting trees along the damaged construction area, applying construction design which includes also the surrounding park and keeping construction equipment in a state that does not cause environmental damage by maintaining low levels of pollution. |
| Adi Karya | Three of the staff gave different answers such as making a banner containing the slogan about green construction, maintaining the surrounding environment, building a park in the vicinity of the project, improving the beauty of the landscape and planting trees at the project site. |

The respondents from the five firms mentioned several methods to promote green construction such as making a banner containing the slogan about green construction, maintaining the surrounding environment, building a park in the vicinity of the project and planting trees at the project site and along the damaged construction area. Using material that can be recycled, saving the energy, keeping construction equipment in a state that does not cause environmental damage, i.e. maintaining low levels of pollution; turning off the light when not in use, disposing waste according to its proper place were also things that can be done to promote green construction. The respondents suggested also that the contractors should make the effort no minimize environmental damage, carry on the company's environmental standards in the projects, reduce material usage that can damage the environment, employ method of operation which does not disturb the natural balance, minimize waste and recycle products such as lumber, dry well, metals, masonry, brick, concrete, carpet, plastic, pipe, rocks, paper, cardboard and the waste during land development.

### 4.2.5 The Obstacles in Promoting Green Construction in the Project

Respondents were asked about the obstacles faced by the contractors in promoting green construction in their project. The respondents identified several obstacles such as in the cost, design, and regulations that the contractors encountered in promoting the green construction in the site. The complete responses representing each of the companies is shown in the table below.

**Table 4.5** Obstacles in Promoting Green Construction in the Project.

| Company | Response |
|---|---|
| Wijaya Karya | Most of the staff in this company identified several obstacles such as in the cost, design, material reuse, regulations and urban planning. One of them said that understanding of the project personnel to perform the material saving in the construction and management of construction waste was also a challenge. |
| Pembangunan Perumahan | Changing the behavior of some people toward green construction, the need for special budget and changing the employee's negative habits such as smoking during working time were some of the obstacles mentioned. |
| Hutama Karya | Three of the staff gave different answers such as the habits of the people in the project, cost and time. The others, however, did not give answers. |
| Waskita Karya | The responds gave different reasons such as the budget, low understanding of "green", lack of supervision from the authority, contradicting regulations, the difficulty of planting trees at the project site, high cost and difficult implementation. |
| Adi Karya | The staff in this company also gave different answers. The majority said that cost and funding were the major constraints of green construction as the contractors rarely put green consideration in their budget when competing at tender process. Moreover, they also mentioned that green building can be easily damaged by the project activity and the difficulty of disposing waste in its proper place as the other obstacles. |

Respondents from the five companies have identified several obstacles in green construction. Among these obstacles were related to the cost, design, material, rules, urban planning, understanding of project personnel to perform the material saving in the construction and management of construction waste. Green construction requires a different behavior of the people involved as their understanding of the "green" concept is still low. While green construction needs special budget, there are conflicting regulations as no special regulation is

currently exist. Thus it creates no incentive for this type of construction and contributes to major cost constraints as contractors rarely make special budget for it at the tender process. Other obstacles included the difficulty of planting trees at the project site as they are easily damaged and the waste disposal.

### 4.2.6 Existence of Green Construction in Semarang

Respondents were asked whether they can mention and describe green construction in Semarang. Not all respondents could mention the green construction in Semarang clearly. The responses representing each of the companies are shown in the table below.

**Table 4.6** Respondents' Awareness of the Green Construction in Semarang

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said yes. But they don't mention it clearly Green construction will create a region that occupies an area which is green and environmentally friendly. |
| Pembangunan Perumahan | Some of the staff said yes. They associated green construction in Semarang with activities such as planting more trees, reducing air conditioner use in project and replacing formwork material from wood with steel or fiber material. |
| Hutama Karya | Three of the respondents did not give answers, but the others said yes and mentioned some green concept such as planting some trees. |
| Waskita Karya | Two of the staff said yes. Green construction in Semarang can be seen in the Sidomukti housing project which has the minimalist concept with green environment as can be seen in the Median Park Road, Youth Monument Park, The Town Square and Roadside Park. |
| Adi Karya | Two of the respondents gave affirmative answer. They mentioned projects such as the Garden City and the development of the city park which is being built by the government in Semarang. The others, however, did not give answers. |

Respondents from the five companies explained that the green construction in Semarang will create a region that it is occupied with greenery and which is environmentally friendly as the contractors were planting more trees at

the project site. Green construction in Semarang can be seen in the Sidomukti housing project which has the minimalist concept with green environment as can be seen in the Median Park Road, Youth Monument Park, The Town Square and Roadside Park and in projects such as the Garden City and the development of the city park which is being built by the government in Semarang.

### 4.2.7 Contractors' Concern with Green Issues

Respondents were asked whether their company should be concerned with green issues. Most of the respondents said that the contractors should be concerned with green issues because it has the potential to contribute to a more sustainable environment. The complete responses representing each of the companies are shown in the table below.

**Table 4.7** Contractors' Concern with Green Issues

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said that the contractors should be concerned with green issues because it has the potential to contribute to a more sustainable environment. As sustainability continues to evolve from being simply a new idea to becoming more of a practical way to build, more innovations, such as the concept that will allow building owners to seamlessly track control their energy usage, will surface and become more popularly embraced. All this, however, was still difficult to realize, one of them said, |
| Pembangunan Perumahan | Most of the staffs responded in the affirmative, as green concept has many benefits. In the short period green concept will decrease project expenditure, while in the long period it will save the environment from destruction and reduce the effects of global warming. |

**Table 4.7** Contractors' Concern with Green Issues (continue)

| Company | Response |
|---|---|
| Hutama Karya | All of the respondents answered in the affirmative, because green concept can reduce pollution in the environment to save the Earth. |
| Waskita Karya | All of the staffs answered in the affirmative, though with different reasons. The contractors should be concerned with green issues as they are one of the elements of the community directly facing the environmental problems. They need to understand that the green project will become easier because of the promotion of this issue and the popularity of green construction in more and more projects. Other reasons cited were because construction projects usually damage the nature and because it is important for the survival of the company. |
| Adi Karya | The majority of respondents said yes. To reduce pollution and environmental damage due to development projects, the contractors should be concerned with green issues. Another reason cited was because green is identical with beauty and comfort. |

The majority of the respondents said that the contractors should be concerned with green issues because they have the potential to contribute to a more sustainable built environment. As sustainability continues to evolve from being simply a new idea to becoming more of a practical way to build, more innovations, such as the concept that will allow building owners to seamlessly track control their energy usage, will surface and become more popularly embraced. In the short period green concept will decrease project expenditure, while in the long period it will save the environment from destruction and reduce the effects of global warming as green concept can reduce pollution in the environment to save the Earth. The contractors should be concerned with green issues as they are one of the elements of the community directly facing the environmental problems. They need to understand that the green project will become easier because of the promotion of this issue and the popularity of green construction in more and more projects. Other reasons cited were because construction projects usually damage the nature, because it is important for the survival of the company to reduce pollution and green environmental change due

to development projects, and also because green is identical with the beauty and comfort.

### 4.3 The Policy of Green Construction

In this section, two questions about the existence of the policy to promote green construction in the companies and the measures which can be used for the application of green construction were asked to evaluate the policy of green construction within each company. The results are as follows:

#### 4.3.1 Existence of the Policy to Promote Green Construction

Respondents were asked whether the company where they are working has a policy to promote green construction. Most of the respondents said that their company had such policy. The examples of the policy can be seen in practices of recycling material (ex, wood) reducing water, electricity and paper usage and saving the energy. The responses representing each of the companies are shown in the table below.

**Table 4.8** Existence of the Policy to Promote Green Construction

| Company | Response |
|---|---|
| Wijaya Karya | All of the respondents said yes. The examples of the policy can be seen in practices of recycling material (ex, wood) reducing water, electricity and paper usage. Other examples include reducing waste, reusing solid waste products, conserving energy and resources, reducing air, soil, and water pollution. |
| Pembangunan Perumahan | Most of the respondents said yes. The policy is about how to fix environment management on building construction in order to increase environmental life quality and create healthy working environment. |

**Table 4.8** Existence of the Policy to Promote Green Construction (continue)

| Company | Response |
|---|---|
| Hutama Karya | All of the respondents in this company also answered in the affirmative. They mentioned ecology friendly program that they had every year. |
| Waskita Karya | Most of the staff they said yes. They mentioned the company's policy to save the energy. No items, however, were found in the contract for re-planting trees. Other respondents did not answer. |
| Adi Karya | The respondents gave different answers. They mentioned the provision of garden decoration during construction, integrating K3 concept with the green environmental conservation programs around the project and building clean environment projects as some of the examples of this policy. |

Almost all of the respondents in the five companies said that the company where they are working had a policy to promote green construction. The examples of the policy can be seen in practices of recycling material (ex, wood) reducing water, electricity and paper usage. Other examples include reducing waste, reusing solid waste products, conserving energy and resources, reducing air, soil, and water pollution. The policy can also be about how to fix environment management on building construction in order to increase environmental life quality and create healthy working environment. One company even had ecology friendly program that every year. The provision of garden decoration during construction, integrating K3 concept with the green environmental conservation programs around the project and building clean environment projects as some of the examples of this policy.

### 4.3.2 The Measures which can be used for the Application of Green Construction

Respondents were asked about the measures which can be used for the application of green construction. The respondents mentioned sevetal measures such as reducing the use of material which can damage environment, employing method of operation which does not disturb the natural balance, conserving

energy and using the environmentally friendly design. The complete responses representing each of the companies are shown in the table below.

**Table 4.9** Measures which can be used for the Application of Green Construction

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents mentioned reducing the use of material which can damage environment and employing method of operation which does not disturb the natural balance as the measures which can be used for green construction application. |
| Pembangunan Perumahan | Most of the respondents said that their company had environmental standard policy, which includes the subject and object measured and safety and health performance that will be evaluated every month. |
| Hutama Karya | Three of the respondents said that the measures which can be used for green construction application included the planting of some trees and by being more disciplined with the work so that it can become ecological friendly. Others said that not destroying the environment by managing the waste well and reducing pollution were among the measures taken by their company. |
| Waskita Karya | Two of the respondents said that the measures which can be used for green construction application in their company included periodic inspection of environmental conditions, the usage of the environmentally friendly material in planning, careful construction implementation so as not to disrupt the natural conditions around, conserving energy and using the environmentally friendly design. The others, however, had no answer for this matter. |
| Adi Karya | The majority of respondents said that the measures which can be used for green construction application in their company included involving K3 officer in construction, beautifying the project site by planting trees around it, maintaining the cleanliness and making a small garden around the project; and holding meetings to discuss this issue in the morning with the whole community/project workers. |

Reducing the use of material which can damage environment and employing method of operation which does not disturb the natural balance as the measures which can be used for green construction application. One company had environmental standard policy, which includes the subject and object measured and safety and health performance that will be evaluated every month. Another company used other measures such as periodic inspection of environmental conditions, the usage of the environmentally friendly material in planning, careful

construction implementation so as not to disrupt the natural conditions around, conserving energy and using the environmentally friendly design. Green construction can also be applied by involving K3 officer in construction, beautifying the project site by planting trees around it, maintaining the cleanliness and making a small garden around the project; and holding meetings to discuss this issue in the morning with the whole community/project workers. The other measures which can be used for green construction application included the planting of some trees and by being more disciplined with the work so that it can become ecological friendly, as well as by not destroying the environment by managing the waste well and reducing pollution were among the measures taken by their company.

## 4.4 Application of Green Construction

In this section, fifteen questions, from whether green construction is expensive to the incentives being offered for green development, were asked to evaluate the application of green construction within each company. The results are as follows:

### 4.4.1 The Cost of Green Construction

Respondents were asked whether green construction is expensive. This is to know whether the contractors viewed green construction as prohibitively costly. There were mixed answers between those who thought green construction was expensive (because they have to increase construction costs beyond their usual budget, etc.) and those who said that green construction actually reduces costs (as it minimizes waste and uses recycled product, etc.). The responses representing each of the companies are shown in the next table.

**Table 4.10** Cost of Green Construction

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that green construction is expensive, as building green means hiring new people with expertise in green building and putting in new investment to start it. One of them, however, said that green construction actually reduces costs as it minimizes waste and uses recycled product. |
| Pembangunan Perumahan | The respondents gave different answers. The ones who said that green construction is expensive argued that by building green new investments are needed to get the equipments which are not noisy and so on. The one who said that green construction is not expensive argued that green principles can easily be applied by everyone in the project, while one respondent said that although green construction might be quite expensive at the beginning, the costs will go down eventually because every material and equipment can be reused. |
| Hutama Karya | Two of the respondents believed that green construction is expensive, as they need to adjust to the new method. The others, however, said that green construction is cost effective and can even make a company more efficient after everyone in the organization become familiar with the concept and change their old habits. |
| Waskita Karya | The respondents gave different answers. Those who said that green construction is expensive thought so because the material used in green construction is not common, thus it might affect cash flow in a project and the company's income. Others, however, believed that green construction is not expensive because green building is necessary to maintain the natural balance and has many benefits and because in Indonesia, plants are cheap and the soil is fertile, thus creating and maintaining greenery is not that difficult. One respondent said that the cost of green construction depends on the method and situation in the field. |
| Adi Karya | The respondents gave different answers. Those who thought that green construction is expensive said so because they have to increase construction costs beyond their usual budget as the contractors usually did not allocate a budget for it in the tender. Other respondents said that green costs depend on the situation. |

The respondents gave different answers. Some considered green construction as expensive, as building green means hiring new people with expertise in green building and putting in new investment to start it and because

they have to increase construction costs beyond their usual budget, as the contractors usually did not allocate a budget for it in the tender. The other arguments were that by building green new investments are needed to get the equipments which are not noisy and so on, and the need also to adjust to the new method as the material used in green construction is also not common, thus it might affect cash flow in a project and the company's income.

Some, however, believed that green construction is not expensive because green principles can easily be applied by everyone in the project. Green building is necessary to maintain the natural balance and has many benefits. In Indonesia, plants are cheap and the soil is fertile, thus creating and maintaining greenery is not that difficult. Green construction is cost effective and can even make a company more efficient after everyone in the organization become familiar with the concept and change their old habits. Another argument was that green construction can even actually reduce costs as it minimizes waste and uses recycled product.

One respondent said that although green construction might be quite expensive at the beginning, the costs will go down eventually because every material and equipment can be reused, while the others said that the cost of green construction depends on the method and situation in the field.

### 4.4.2 Existence of Standard Operating Procedure in the Company to Promote Green Construction

Respondents were asked whether their company has a standard operating procedure to promoting green construction. The respondents also gave mixed responses in this matter. Some of the respondents said that their company had such procedure, such as always using recycle material etc., while some others did not know about the procedure. The responses representing each of the companies are shown in the table below.

**Table 4.11** Existence of Standard Operating Procedure (SOP) in the Company to Promote Green Construction

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that their company had such procedure, such as always using recycle material, work methods which does not produce waste above the tolerable units whenever possible. One of them said that for environmental project the company even had environmental standard operating procedure. |
| Pembangunan Perumahan | The majority of the staffs said that their company had such a procedure. Every worker had to clean the places they worked at before leaving. The company also used generator of the silent type. Moreover, the company had green construction target implementation guidance and monthly assessment regarding this issue. |
| Hutama Karya | Two of the respondents they said that such procedure existed in their company, as it is included in the ISO 14000 program. The others, however, did not know about the procedure. |
| Waskita Karya | Two of the staff said that their company had such a procedure. SOP mostly suited to the condition of the project. The company also had periodic inspection of the environment. Other respondents, however, did not know the existence of such procedure in the company. |
| Adi Karya | Some of the respondents said their company had that kind of standard operating procedure, as it is included in the K3 program. In practice the company maintained the cleanliness and beauty in the vicinity of the project. Others, however, did not give answers. |

The majority of the responds said that their company had such procedure. One of these companies even had environmental standard operating procedure for environmental project. The procedures included practices such as always using recycle material work methods which does not produce waste above the tolerable units whenever possible. Other procedure included asking every worker to clean up the places they worked at before leaving, using generator of the silent type, putting green construction target implementation guidance, monthly assessment regarding this issue and periodic inspection of the environment.

Standard operating procedures to promote green construction have actually been included in the ISO 14000 the ISO 14000 is a series of international standards on environmental management. It provides a framework for the development of an environmental management system and the supporting audit programmed. and the K3 program. In practice the company maintained the cleanliness and beauty in the vicinity of the project. The SOP were also mostly suited to the condition of the project.

### 4.4.3 Knowledge about the Leadership in Energy and Environmental Design

Respondents were asked whether they know about know about the Leadership in Energy and Environmental Design (LEED). Almost all of them did not know about the LEED. The responses representing each of the companies are shown in the table below.

**Table 4.12** Knowledge about the Leadership in Energy and Environmental Design

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that they did not know about the Leadership in Energy and Environmental Design (LEED). One of them said that LEED is an internationally recognized green building certification system which provides third-party verification that a building or community is designed and built using strategies intended to improve performance in metrics such as energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. |
| Pembangunan Perumahan | The majority of the staff mentioned several challenges to become the leader in green construction. Every building they build should be based on green building concept with low energy consumption in its electrical and door and window designs. All should be in reference to the green building standard. |
| Hutama Karya | The respondents did not know about LEED. |
| Waskita Karya | Two of the staff they said that leadership in this field can be obtained by restricting the use of energy, designing construction by considering its environmental aspect and putting more concern on designs that take care the nature and create less damage. Others did not know about this matter. |
| Adi Karya | All respondents did not give answers for this question. |

The majority of the respondents did not know about the Leadership in Energy and Environmental Design (LEED). Only of them said that LEED is an internationally recognized green building certification system which provides third-party verification that a building or community is designed and built using strategies intended to improve performance in metrics such as energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Leadership in this field can be obtained by restricting the use of energy, designing construction by considering its environmental aspect and putting more concern on designs that take care the nature and create less damage. Several challenges also present as every building they build should be based on green

building concept with low energy consumption in its electrical and door and window designs. All should be in reference to the green building standard.

### 4.4.4 Knowledge about Indonesian Green Building Council

Respondents were asked what they know about the Indonesian Green Building Council. Almost all of the respondents did not know about this organization. The complete responses representing each of the companies are shown in the table below.

**Table 4.13** Knowledge about Indonesian Green Building Council

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that they did not know about the Indonesian Green Building Council. One of them, however, said that the Indonesian Green Building Council is an independent (nongovernment) and nonprofit organization that is fully committed to educating the community in applying the best practices to facilitate the transformation of the environmental and sustainable global construction industry. GBC Indonesia is a member of the World Green Building Council (WGBC), which is based in Toronto, Canada. WGBC currently has 73 member countries. |
| Pembangunan Perumahan | The staff underlined their company's commitment to designing and applying the green principles in the design and achieving what is supposed to be a green building standard. Green building cannot merely remain a trend; it has to be a lifestyle change. The demand of the consumer of a "green" living environment is in line with the planet's current challenges such as climate change and degrading environmental conditions. The GBC Indonesia organization is a non-governmental organization meant to apply green principals in building planning. |
| Hutama Karya | Most of the respondents did not know about GBC Indonesian Green Building Council. But one of them said that the organization might be an environment department. |

**Table 4.13** Knowledge about Indonesian Green Building Council. (Continue)

| Company | Response |
|---|---|
| Waskita Karya | The majority of the staff had no idea about the GBC Indonesia. One of them, however, said that the organization helps building green awareness to the construction company, students and campus. |
| Adi Karya | One of the respondents said that the organization focuses on the developments which put consideration to the beauty and cleanliness of the environment. The other respondents did not give answers. |

The majority of the respondents did not know about the Indonesian Green Building Council. Only one of them said that the Indonesian Green Building Council is an independent (nongovernment) and nonprofit organization that is fully committed to educating the community in applying the best practices to facilitate the transformation of the environmental and sustainable global construction industry. GBC Indonesia is a member of the World Green Building Council (WGBC), which is based in Toronto, Canada. WGBC currently has 73 member countries.

Other respondents explained The GBC Indonesia organization as a non-governmental organization meant to apply green principals in building planning, help building green awareness in the construction industry, students and campus and focus on the developments which put consideration to the beauty and cleanliness of the environment. They also reiterated their commitment to designing and applying the green principles in the design and achieving what is supposed to be a green building standard. Green building cannot merely remain a trend; it has to be a lifestyle change. The demand of the consumer of a "green" living environment is in line with the planet’s current challenges such as climate change and degrading environmental conditions.

### 4.4.5 The Possibility to Spread the Application of the Green Construction Idea in Semarang

Respondents were asked whether it is possible to spread the application of the idea of green construction in Semarang. The majority of the respondents said that it was possible to spread the application of the idea of green construction in Semarang, as it can be done also in collaboration with government agencies. The responses representing each of the companies are shown in the table below.

**Table 4.14** Possibility to Spread the Application of the Green Construction Idea in Semarang

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that it was possible to spread the application of the idea of green construction in Semarang. However, it mostly depends on the people and government policy. |
| Pembangunan Perumahan | All of them said that it was possible to spread the application of the idea of green construction in Semarang by doing simple things such as replacing the materials produced from wood with steel that can be reused and by applying it gradually little by little. |
| Hutama Karya | Most of the respondents said that it was possible if the government acts proactively and spreads brochure. |
| Waskita Karya | The majority of the respondents said that it was possible to spread the application of the idea of green construction in Semarang. It can be done in collaboration with government agencies and universities to disseminate the need for "go green" and to implement regulations made in local legislation and by creating a media campaign for green construction. |
| Adi Karya | One respondent said that it was possible, with the emphasis on building city parks. One of them, on the other hand, said it was not possible, as it required big budget, while the other had no idea for this matter. |

The majority of the respondents said that it was possible to spread the application of the idea of green construction in Semarang by doing simple things such as replacing the materials produced from wood with steel that can be reused

and by applying it gradually little by little. Some respondents also put the emphasis on building city parks.

The spread the application of the idea of green construction in Semarang, however, mostly depends on the people and government policy. The government needs to act proactively and spreads brochure and collaborate with the universities to disseminate the need for "go green" and to implement regulations made in local legislation and by creating a media campaign for green construction. One of them, on the other hand, said that spreading the application of the idea of green construction in Semarang was not possible, as it required big budget, while the other had no idea for this matter.

### 4.4.6 Experience in the Green Construction

Respondents were asked whether they have any experience in the green construction. The contractors with the most experience in the green construction were Wijaya Karya and Pembangunan Perumahan. The complete responses from respondents representing each of the companies are shown in the table below.

**Table 4.15** Experience in the Green Construction

| Company | Response |
|---|---|
| Wijaya Karya | All of the respondents said that they had experience in the green construction. They gave examples in the Semarang's Paragon City project and the STP building. Utilization of land for waste water treatment and "Turbidity curtain" are some of the challenges in construction related to the water issues. Wijaya Karya (WIKA), with help from USAID has also been implementing ways to protect against this kind of water pollution. |
| Pembangunan Perumahan | The majority of the staffs said that they had experience in the green construction. The company builds a hospital with design to balance the trees and the building, reduces wood material usage, and makes bio pores for water absorption. |
| Hutama Karya | Most of the respondents they said they had no such experience. The others, however, had experience in waste separation. |

**Table 4.15** Experience in the Green Construction. (Continue)

| Company | Response |
|---|---|
| Waskita Karya | The majority of the staffs did not have experience in green construction. Only one of them had experience in building park in a housing complex and a residential street park. |
| Adi Karya | One of the respondents had the experience. In every project the respondent always keep the environment in mind and protect the environment around. But the others said that they had no idea. |

The majority the respondents had experience in the green construction. They gave examples such as the Semarang's Paragon City project, the STP building, a hospital with design to balance the trees and the building and the building of park in a housing complex as well as a residential street park. In every project the respondent always kept the environment in mind and protected the environment around project site. They also reduced wood material usage, and made bio pores for water absorption and separated waste as utilization of land for waste water treatment and "turbidity curtain" are some of the challenges in construction related to the water issues.

### 4.4.7 Examples of Projects Currently Being Built which Promote Green Construction in Semarang

Respondents were asked about examples of projects currently being built which promote green construction in Semarang. The respondents gave several examples such as the Undip complex in Tembalang and the Paragon City. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.16** Examples of projects which promote green construction in Semarang

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents mentioned the Paragon City project and another project in Kaligarang. |
| Pembangunan Perumahan | The majority of the pointed the development of BPK project in Pudak Payung Semarang and the Undip complex in Tembalang. |
| Hutama Karya | The respondents did not mention any project and instead saying something about planting some trees and waste management. |
| Waskita Karya | Two of the respondents gave examples of projects in the Sidomukti housing complex, a project in Kaligawe, the Jatibarang dam project and the making of parks along the city streets. The others had no idea. |
| Adi Karya | Two of the respondent mentioned some projects such as the current city park renovation project in Simpang Lima and the City Park project. But the others had no idea on this matter. |

The respondents mentioned the Paragon City project, another project in Kaligarang, the development of BPK project in Pudak Payung, the Undip complex in Tembalang, the Sidomukti housing complex, a project in Kaligawe, the Jatibarang dam project and the making of parks along the city streets, the current city park renovation project in Simpang Lima, and the City Park project.

### 4.4.8 How to Lower the Project's Energy Consumption

Respondents were asked what they would do to lower the project's energy consumption if they were a project manager with mandate to deal with the problem. The respondents said that the project's energy consumption can be lowered by several steps such as using water and electricity wisely and utilizing the waste materials in the project properly. The respondents' responses representing each of the companies are shown in the table below.

**Table 4.17** How to lower the project's energy consumption

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that the project's energy consumption can be lowered by using the tools according with the time and function, using water and electricity wisely and using the energy-efficient equipment and appliances. |
| Pembangunan Perumahan | The majority of the respondents said that the project's energy consumption can be lowered by reducing electrical consumption (lamp, water, pump, etc), gasoline consumption and maximizing the use of other natural resources such as gas and coal. |
| Hutama Karya | All of the responds said that the project's energy consumption can be lowered by stepping up the campaign of low energy in the company. Stickers with messages on energy saving, like turn off the light during daylight, were put in every room. Offices were also built with many windows so that light can come in and reduce electricity usage. |
| Waskita Karya | Most of the respondents said that the project's energy consumption can be lowered by making a rule and building awareness of saving energy as well as by using low-energy electricity product. Practical example can also be found in the use of air conditioning schedule and efficient lighting. |
| Adi Karya | Two of the respondents said that the project's energy consumption can be lowered by utilizing the waste materials in the project properly. But the others had no idea on this matter. |

The majority of the respondents said that the project's energy consumption can be lowered. Several practices which can be used included using the tools according with the time and function, using water and electricity wisely, using the energy-efficient equipment and appliances, reducing electrical consumption (lamp, water, pump, etc), gasoline consumption and maximizing the use of other natural resources such as gas and coal. The project's energy consumption can be lowered by stepping up the campaign of low energy in the company as by putting stickers with messages on energy saving, like turn off the light during daylight in every room, building offices with many windows so that light can come in and reduce electricity usage, making a rule and building awareness of saving energy, using a schedule in air conditioning and utilizing the waste materials in the project properly.

### 4.4.9 Resources Efficiency of Green construction

Respondents were asked whether green construction is resources efficient in their opinion. The respondents mentioned several reasons of why green construction was resources efficient such as because its application will result in efficient electric/energy usage and because it uses the material waste which can reduce cost and save money in construction process. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.18** Resources Efficiency of Green construction

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that green construction is resources efficient because it uses the material waste which can reduce cost and save money in construction process. |
| Pembangunan Perumahan | Most of the respondents said that green construction is resources efficient because it can reduce operational and fabrication costs. One of them, however, said that it is not resources efficient as the material price is expensive. |
| Hutama Karya | The majority of the respondents said that green construction is resources efficient because its application will result in efficient electric/energy usage, and therefore will put down cost. |
| Waskita Karya | Some of the respondents said that green construction is resources efficient because not only that it reuse the source of material, it can also preserve the nature, save energy and enjoyed by all people. Other respondents in this company, however, had no idea regarding this matter. |
| Adi Karya | Two of the respondents said green construction can function very well in the company. But it implementation depends on the project funding as very big budget is required for this. Other respondents had no idea on this matter. |

The majority of the respondents said that green construction is resources efficient because it reuses the material waste which can reduce cost and save money in construction process. Other arguments why green construction is resources efficient are because it can reduce operational and fabrication costs and that its application will result in efficient electric/energy usage, and therefore will

put down cost. One of them, however, said that it is not resources efficient as the material price is expensive. Another one said that it depends on the project funding as very big budget is required for this. Other respondents, however, had no idea regarding this matter.

### 4.4.10 Property Development in a City that Currently Offers or Has Offered Incentives for Green Building

Respondents were asked to explain whether their company has developed property in a city that currently offers or has offered incentives for green building at the time of construction. Almost all of the respondents failed to mention the city offering such incentive. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.19** Property Development in a City that Currently Offers or Has Offered Incentives for Green Building

| Company | Response |
|---|---|
| Wijaya Karya | All of the respondents said that they had no idea on this matter. |
| Pembangunan Perumahan | One of the respondents said in the affirmative, but the others did not give answers, |
| Hutama Karya | All of the respondents said that their company has not developed property in such cities. |
| Waskita Karya | One of the respondents said that the company has not had a chance to develop property in such cities, while the others did not give answer. |
| Adi Karya | All of the respondents said in the negative. Because there was no budget and no incentive offered to build green, the company usually only made a small garden around the project site. |

Almost all of the respondents did not even have idea whether their company has developed property in a city that currently offers or has offered incentives for green building at the time of construction. These results can show

that the green incentives are very negligible not the main motivation for the company in deciding where they are going to pursue construction tender.

### 4.4.11 The Cities Offering Incentives for Green Development

Respondents were asked about the cities which have offered or are offering their company incentives for green development. The cities mentioned by the respondents were Jakarta, Semarang, Kudus and Jepara. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.20** Cities Offering Incentives for Green Development

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said that they did not have idea on this matter, and only one of them mentioned Jakarta as the city offering incentives for green development. |
| Pembangunan Perumahan | One of the respondents said Semarang, but the others did not give answers, |
| Hutama Karya | All of the respondents did not answer this question. |
| Waskita Karya | One of the respondents mentioned Semarang. Jepara and Kudus (the Muria region), but the others did not give answer. |
| Adi Karya | All of the respondents did not answer the question, though one of them said that the company had some incentive. |

Most of the respondents could not name the cities which have offered or are offering their company incentives for green development. Only some managed to name some cities i.e. Jakarta, Semarang, Jepara and Kudus (the Muria region) as the cities with some incentive. The results show that green construction concept is still new that only very few cities even considering giving incentives to speed up its development.

### 4.4.12 The Form of Incentives to Build Green Construction

Respondents were asked about the form of the incentives offered to the contractors to build green construction. Most of the respondents could not mentioned the form of such incentive. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.21** Form of Incentives to Build Green Construction

| Company | Response |
|---|---|
| Wijaya Karya | All of the respondents said that they did not have any idea about such incentives. |
| Pembangunan Perumahan | One of the respondents only said that the company installed a lot of windows to decrease electricity consumption, but the others did not give answer. |
| Hutama Karya | All of the respondents did not answer this question. |
| Waskita Karya | One of the respondents said that the incentive was in the form of free tree seedlings, while the others did not give answer. |
| Adi Karya | All of the respondents did not answer the question. |

Almost all of the respondents could not mention even a single form of incentive offered to contractors to build green construction. Only one respondent mentioned that his company was given free tree seedlings as incentive. This is quite shocking as it means that incentive to build green construction is almost non-existent in the industry. The results show that green construction concept is still only a foreign concept with little practical effect in Semarang. While green incentives can actually be given to the contractors in many forms, the most important thing is to create awareness among all related parties that green construction concept is necessary for the people and the environment.

### 4.4.13 The Most Significant Incentives for Contractors to Develop Green Construction Projects

Respondents were asked about the incentives which would be the most significant for contractors to develop green construction. Most of the respondents

also failed to give a clear answer for this issue. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.22** Most Significant Incentives for Contractors to Develop Green Construction Projects

| Company | Response |
|---|---|
| Wijaya Karya | All of the respondents said that they had no idea on this matter. |
| Pembangunan Perumahan | One of the respondents said that the most significant incentive for the company would be the incentive which can reduce cost. Others, however, did not give answer. |
| Hutama Karya | All of the respondents did not answer this question. |
| Waskita Karya | Some of the respondents said that the most significant incentives for the company would be an award given to the contractors that care to "go green" and special reward from government. The other respondents, however, did not give answer. |
| Adi Karya | Most of the respondents did not answer the question. Only one of them said that the incentive could be in the form of giving overtime pay. |

Almost all of the respondents did not mention the form of incentive most significant for the company. Only one said that the incentive should be in the form that can reduce cost, while some others said that the most significant incentives for them would be an award given to the contractors that care to "go green" and special reward from government. Incentive could also be given directly to the employee in the form of giving overtime pay.

### 4.4.14 The Most Compelling Approach to Consider in Building Green aside from Government or Client Requirement

Respondents were asked about the most compelling approach to consider in building green aside from government or client requirement, based on their experience. The respondents mentioned several approaches such as developing green building can bring advantage, improve marketing, minimize cost

(overhead), while also following the lifestyle trend in the present and future. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.23** Most Compelling Approach to Consider in Building Green aside from Government or Client Requirement

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said that they had no idea regarding this matter. One of them explained that in the company's experience lowering the cost of the construction is more important than any other approaches. |
| Pembangunan Perumahan | Two of the respondents said that before construction, green material requirements mostly came from the client. The other respondents did not give answers. |
| Hutama Karya | All of the respondents did not answer this question. |
| Waskita Karya | Most of the respondents mentioned marketing, minimizing cost (overhead), following the lifestyle trend in the present and future. Other than showing awareness of nature, green buildings are very functional and have aesthetic value. |
| Adi Karya | Three of the respondents pointed to the benefits which can be obtained from constructing green building as the most compelling approach to consider in building green aside from government or client requirement. They believed that developing green building can bring advantage. |

Most of the respondents said that they had no idea regarding this matter. Two respondents said that before construction, green material requirements mostly came from the client. One respondent explained that in the company's experience lowering the cost of the construction is more important than any other approaches. Some other respondents mentioned marketing, minimizing cost (overhead), following the lifestyle trend in the present and future and the benefits and advantages which can be obtained from constructing green building as their most compelling approaches to consider in building green aside from government or client requirement. Other than showing awareness of nature, green buildings are very functional and have aesthetic value.

### 4.4.15 One Brief Reason Why Local Incentives Will Help Build Momentum for Green Building Development

Respondents were asked to give one brief reason why they think local incentives will help build momentum for green building development. Among the respondents' responses were because these incentives will provide motivation to build more green building and because the local authority has the biggest role in regional development planning. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.24** One Brief Reason Why Local Incentives Will Help Build Momentum for Green Building Development

| Company | Response |
|---|---|
| Wijaya Karya | All of the respondents said that they did not have idea regarding this matter. |
| Pembangunan Perumahan | Two of the respondents said that local incentives will help building momentum for green building development if it is supported by other parties, especially government, as it creates the awareness of the people to reduce global warming. |
| Hutama Karya | Two of the respondents said that local incentives will help building momentum for green building development because these incentives will provide motivation to build more green building. The other respondents did not provide answer. |
| Waskita Karya | Most of the respondents said that because the politics have shifted toward the local/regional autonomy in Indonesia, the local authority has the biggest role in regional development planning to build momentum of green building development. |
| Adi Karya | Three of the respondents did not give answer, while one respondent said that local incentives is necessary as it can provide the reward for the performance of workers. |

Some respondents said that local incentives will help building momentum for green building development if it is supported by other parties, especially government, as it creates the awareness of the people to reduce global warming and provides motivation to build more green building and reward the performance of the workers. Other respondents said that because the politics have shifted

toward the local/regional autonomy in Indonesia, the local authority has the biggest role in regional development planning to build momentum of green building development.

## 4.5 The Process of Green Construction

In this section, seven questions, ranging from the availability of materials used in green construction in Semarang to the management of waste in the construction process, were asked to evaluate the process of the green construction within each company. The results are as follows:

### 4.5.1 The Availability of Green Construction Materials in Semarang

Respondents were asked whether all of the materials used in green construction are available in Semarang. The respondents mentioned several materials available such as hebel, citycon and brick replacement material that is more environmentally friendly. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.25** Availability of green construction materials in Semarang

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said that all of the materials used in green construction such as hebel, citycon and brick replacement material that is more environmentally friendly are available in Semarang, while the other did not have idea on this matter. |
| Pembangunan Perumahan | Two of the respondents said that most materials such as wood, roof, plastic, and steel are available in Semarang. |
| Hutama Karya | Two of the respondents said that the materials used in green construction are not available in Semarang. The others did not give answer. |
| Waskita Karya | Most of the respondents said that the materials used in green construction are available in Semarang. 'Green materials' are available everywhere as the seller of plants and garden-making material can be found easily and wood house can be substituted with light steel. |

**Table 4.25** Availability of green construction materials in Semarang. (Continue)

| Company | Response |
|---|---|
| Adi Karya | Three of the respondents did not give answer. One of them, however, said that almost everything can be found in Semarang. Formwork/boards using materials such as wood so can be reused if not in use anymore. |

Most of the respondents said that the materials used in green construction are available in Semarang. Green materials are available everywhere as the seller of plants and garden-making material and specific materials such as hebel, citycon and brick replacement material that is more environmentally friendly, wood, roof, plastic, and steel can be found easily in Semarang. Formwork/boards using materials such as wood so can also be reused if not in use anymore and wood house can be substituted with light steel. Two of the respondents, however, said that the materials used in green construction are not available in Semarang.

### 4.5.2 The Reduce in Materials Usage

Respondents were asked whether the company where they are working reduces its material usage and how it is done. The respondents gave mixed answers on this issue. Wijaya Karya and Waskita Karya were the contractors that have reduced material usage. The responses representing each of the companies are shown in the table below.

**Table 4.26** Reduce in Materials Usage

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said that the company used hebel so that it can reduce PVC usage. The company’s culture had an efficient method called “invention" which can be used to find new way for more efficient materials which have the same or better quality. |

**Table 4.26** Reduce in Materials Usage. (Continue)

| Company | Response |
|---|---|
| Pembangunan Perumahan | Two of the respondents said the company where they were working reduced its material usage. One example is the usage of wood. Keeping stock with single measurement for any pieces has decreased wood consumption, while in panel formwork the company replaced the wood frame with steel hollow. |
| Hutama Karya | All of the respondents said that the company they worked at did not reduce its material usage because the material was already provided in accordance with the specification. |
| Waskita Karya | Most of the respondents said that the company they worked at has reduced its material usage as it could handle materials more efficiently and create savings. The others, however, the company could not reduce material usage as it must keep up with the construction standard. |
| Adi Karya | Two of the respondents said that the company viewed utilizing the waste in project as the best method to reduce the use of new materials. Two of them, however, did not give answer. |

There were many ways for the companies to reduce their material usage. Some respondents said that their company used hebel so that it can reduce PVC usage and always try to find new way for more efficient materials which have the same or better quality. Other example to reduce material usage was in the usage of wood. Keeping stock with single measurement for any pieces has decreased wood consumption, while in panel formwork the wood frame can be replaced with hollow steel. Reducing material usage can also be obtained by handling materials more efficiently and utilizing the waste in project. Other respondents, however, said that their company could not reduce material usage as it must keep up with the construction standard and because the material was already provided in accordance with the specification.

### 4.5.3 Contractors' Materials Reuse

Respondents were asked whether their company reuses the materials. All contractors has practiced materials reuse. The complete respondents' responses representing each of the companies are shown in the next table.

**Table 4.27** Contractors' Materials Reuse

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said that their company reused the materials. They cited the reuse of wood material from the company's project in Solo. One of them said that green construction must seek ways to reduce waste of energy, water and materials used during construction. Deconstruction can be used as the method of harvesting what is commonly considered as "waste". |
| Pembangunan Perumahan | Two of the respondents said that their company reused the materials. It is done mostly by using steel instead of wood. |
| Hutama Karya | Most of the respondents said that their company reused the materials. Practical ways of reusing material can be seen in the reuse of transformation bar and the collection of waste reinforcement and formwork. |
| Waskita Karya | Most of the respondents said that their company reused the materials such as the formwork for concrete work and the wood material which is still proper to be used again. |
| Adi Karya | Most of the respondents said that their company reused the materials by utilizing formwork wood that is still feasible to use and always using the other building materials from natural sources. |

Most of the respondents said that their company reused the materials. One of them said that green construction must seek ways to reduce waste of energy, water and materials used during construction. Deconstruction can 9e used as the method of harvesting what is commonly considered as "waste". Practical ways of reusing materials can be seen in the reuse of transformation bar and the collection of waste reinforcement and formwork, utilizing formwork wood that is still feasible to use and the wood material which is still proper to be used again, using

steel instead of wood and by always using the other building materials from natural sources.

### 4.5.4 Recycling of the Materials Waste

Respondents were asked whether their company recycles material waste. All contractors has also recycled their material wastes. The complete respondents' responses representing each of the companies are shown in the next table.

**Table 4.28** Recycling of the Materials Waste

| Company | Response |
|---|---|
| Wijaya Karya | Most of the respondents said that their company recycled material waste, such as using steel waste to build/make another structure (ex. the stairs). One of them said the company recycled stone, metal, and other products that are non-toxic, reusable, renewable, and/or recyclable (e.g. trees, linoleum, sheep wool, panels made from paper flakes etc,). |
| Pembangunan Perumahan | Two of the respondents said that their company recycled material waste. Bigger cut of wood would be used for other things such as chair, desk or part of roof. The company also told the employee to use both side of paper in the notebook. |
| Hutama Karya | Two of the respondents said that their company recycled material waste according with the specification. |
| Waskita Karya | Two of the respondents said that their company recycled material waste whenever possible. The company recycled wood to be made into fertilizer. The other respondents did not know whether their company recycled material waste. |
| Adi Karya | Two of the respondents said that their company recycled materials that were not in use anymore. The waste was then sold with the proceeds then used to procure new materials. Others did not answer. |

The respondents mentioned several methods used by their respective companies to recycle material waste. These methods included using steel waste to build/make another structure (ex. the stairs), recycling the stone, metal, and other

products that are non-toxic, reusable, renewable, and/or recyclable (e.g. trees, linoleum, sheep wool, panels made from paper flakes etc,), using bigger cut of wood to be used for other things such as chair, desk or part of roof, telling the employee to use both side of paper in the notebook to save paper, recycling material waste according with the specification, recycling wood to be made into fertilizer and selling the waste and using the proceeds from it then used to procure new materials.

### 4.5.5 Materials Selection for the Project

Respondents were asked about how the company where they are working selects material for the projects. The contractors used different methods in selecting materials for projects. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.29** Contractors' Materials Selection for the Project

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that the company used the materials needed in construction work according to the terms of condition. One of them said that the company used materials that are available locally to create the concept of natural building. |
| Pembangunan Perumahan | Two of the respondents said that their company selected the materials according to their specifications, measurement, type, usage and recyclability. |
| Hutama Karya | Two of the respondents said that their company selected the cheapest materials. The others, however, said that material selection was based according to the specification. |
| Waskita Karya | Most of the respondents said that material selection depended on the budget, quality and production area (the company preferred to choose materials closely available to the project), material specifications that fulfill the requirement of project which are also suitable to the existing funds. |
| Adi Karya | Most of the respondents said that for the materials for the project the company was looking at the technical requirements specification. The important thing is to get the highest quality of materials with the right quantity at competitive prices. |

Material selection for the construction work depended on the budget, quality and production area (the company preferred to choose materials closely available to the project), the terms of condition needed in construction work, material specifications that fulfill the requirement of project, suitability to the existing funds, measurement, type, usage and recyclability. When looking at the technical requirements specification, the important thing is to get the highest quality of materials with the right quantity at competitive prices. Other considerations in selecting materials were choosing materials that are available locally to create the concept of natural building and finding the cheapest possible materials.

### 4.5.6 Waste Management during the Construction Process

Respondents were asked about their handling of waste in the construction project. All contractors selected and separated their waste so that it can be better managed. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.30** Waste Management during the Construction Process

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that to manage waste during the construction process the company chose the material that can still be used and put it in a separate place that can be easily reached. Construction waste recycling is the separation and recycling of recoverable waste materials generated during construction and remodeling. Packaging, new material scraps and old materials and debris all constitute potentially recoverable materials. |
| Pembangunan Perumahan | Two of the respondents said that to manage waste in the project the company stored it in the places previously prepared for this function depending on the type of the material waste. |
| Hutama Karya | Three of the respondents said that the company separated the dry and wet garbage. Chemical waste was grouped into B3 and non B3. The others gave no answer. |

**Table 4.30** Waste Management during the Construction Process. (Continue)

| Company | Response |
|---|---|
| Waskita Karya | Most of the respondents said their company separated the waste of construction using green construction method. The company also separated the chemical waste from other waste, recycled and worked with waste management company. All steps were in accordance with SOP of the K3 LM project (HSE). |
| Adi Karya | The majority of the respondents said that their company separated the waste which can still be used, as well as using more waste disposal and selling the remaining construction materials in storage. |

There were several methods used by the contractors to manage waste during the construction process. These methods included choosing the material that can still be used and putting it in a separate place that can be easily reached, storing the waste in the places previously prepared for this function depending on the type of the material waste, separating the dry and wet garbage, separating the chemical waste from other waste and grouping chemical waste into the B3 and non B3; using more waste disposal and selling the remaining construction materials in storage, as well as recycling the waste and working together with waste management company. Construction waste recycling is the separation and recycling of recoverable waste materials generated during construction and remodeling. Packaging, new material scraps and old materials and debris all constitute potentially recoverable materials.

### 4.5.7 Financial Implication of the Waste Management on Construction Costs

Respondents were asked whether the waste management has financial implication on the costs of the construction. The respondents gave mixed answers for this issue. Some said there was financial implication, while others saw no financial implication of waste management in the construction costs. The complete respondents' responses representing each of the companies are shown in the table below.

**Table 4.31** Financial Implication of the Waste Management on Construction Costs

| Company | Response |
|---|---|
| Wijaya Karya | The majority of the respondents said that waste management did not have financial implication on the costs of the construction. One of them, however, said that waste management had financial implication on the costs of the construction as there are some additional costs involved in recycling construction material waste. Cost saving, however, can even be realized through the efficient design and use of materials minimizing waste after an established procedure is developed. |
| Pembangunan Perumahan | Two of the respondents said that waste management had financial implication on the costs of the construction. |
| Hutama Karya | Most of the respondents said that waste management had financial implication on the costs of the construction, though one of them also said that it is not much. |
| Waskita Karya | Most of the respondents said that waste management did not have financial implication on the costs of the construction, because waste management cost is only a fraction of the project value. One of them, however, said that it depends on the kind of waste and the procedure of the waste management. |
| Adi Karya | The majority of the respondents said that waste management had both positive and negative financial implication on the costs of the construction. Though waste management can help efficiency, it requires funds to process waste and waste disposal mobilization for the waste that cannot be recycled needs manpower that must be paid. |

There were different opinions from the respondents on this matter. Some of them said that waste management did not have financial implication on the costs of the construction, because waste management cost is only a fraction of the project value.

Others, however, thought differently as they perceived that waste management indeed had financial implication on the costs of the construction as there are some additional costs involved in recycling construction material waste. They viewed that waste management had both positive and negative financial implication on the costs of the construction. Though waste management can help

efficiency, it requires funds to process waste and waste disposal mobilization for the waste that cannot be recycled needs manpower that must be paid and that cost saving can only be realized through the efficient design and use of materials minimizing waste after an established procedure is developed. Another respondent said that financial implication of waste management on the costs of the construction depends on the kind of waste and the procedure of the waste management.

# CHAPTER 5

# DISCUSSION

## 5.1 Knowledge of Green Construction

The majority of respondents in different positions have heard about the term "green building" before. Some of them gave various examples and definition of this term. They also stated several benefits related to "green building", such as in increasing the efficiency of energy and water and reducing the impact of the environment. They also mentioned their efforts to promote green building by reducing waste and using recycled materials. On the other hand the respondents have also identified several obstacles faced by the construction industry in constructing green project in aspects such as the price, design, and re-using of materials.

The respondents were aware of the "green construction" concept. They viewed this concept as the means to creating greenery and environmentally friendly projects. The respondents also stated their opinion that the contractors must be concerned with "green construction" issues, because this kind of construction will help build more sustainable environment and create comfort. In this case, more education for the contractors on this issue is needed. The contractors need to know all of the information related with the green construction so that they can understand the benefits of the green construction, and hence applying it in their operation. In general the results obtained from the questionnaire on the contractors' knowledge of green construction are almost similar with the findings mentioned of similar studies in the literature review.

## 5.2 Policy of Green Construction

In this part of the questionnaire, the respondents said their respective companies had the policy of green construction. There were also several challenges faced by these companies in implementing this policy such as in fixing

the environmental management on building construction in order to increase life quality in the environment, and in creating healthy working environment. The government should require the contractors to have the commitment to make their construction projects have ‘green’ credentials. This can provide surroundings for the people to live a comfortable, pollution-free life which can save the environment. The contractors have also followed environmental standard policy and used the operational method which does not disturb the natural balance. Thus, in general, the contractors’ policy to follow green concept and regulations can lead to the creation of a healthy, convenient, and pollution-free environment which is good for the atmosphere.

### 5.3 Application of Green Construction

In this part the respondents provided different answers. Some conflicting answers can be seen in the answers regarding the cost of green construction, the standard operating procedure for green construction, and the definition for Leadership in Energy and Environmental Design (LEED) and the Green Building Council Indonesia. The respondents said that it was possible to spread the application of the idea of green construction in Semarang by collaborating with the government agencies and universities to disseminate the need for "go green", implementing the regulations in local legislation and by creating a media campaign or green construction. The contractors have already had experience in green construction. They gave some example such as the Paragon City project, the STP building, the Kaligarang project, the BPK project in Pudakpayung, the Sidomukti housing complex, the project in Kaligawe, the Jatibarang dam, and the City Park project.

The respondents also mentioned some steps to lower the project’s energy such as using water and electricity wisely, writing in every room warning sticker about energy saving like ‘turn light off during daylight’ and building offices with many windows so that light can come in and electricity usage can be economized. According to the majority of the respondents green construction was resources

efficient, because it uses waste material which in turn will reduce cost and save money in construction process. The contractors believe that there were several cities that offered the contractors incentives for green development, i.e. Jakarta, Semarang, Jepara and Kudus. The respondents, however, could not mention many incentives that these cities offered. They viewed that most significant incentives for the contractors to develop green construction projects can be in the form of an award given to contractors which have the biggest "green construction" credential. Giving reward can also give motivation for the contractors to do better. The respondents also identified lowering cost of the construction budget as the best approach to promote green construction and supported the idea that local incentives will help build momentum for green building development.

### 5.4 The process of Green Construction

This part of the questionnaire discusses the process of green construction. As in the previous section, some of the answers were also contradictory as in the answers regarding the availability of green materials in Semarang, the method to reuse and recycle waste material and the selection of the materials used in green construction. Recycling waste materials can be done by recycling the stone, metal, and other products that are non-toxic, reusable and renewable, using bigger cut of wood to be used for other things such as chair, desk or part of roof, and recycling wood to be made into fertilizer and selling the waste and using the proceeds from it then used to procure new materials. Selecting materials depend on the budget, quality, production area and technical requirements specification. Separation of the dry and wet garbage, as well as the chemical and non-chemical waste was also important. The respondents did not have agreement on the financial implication of waste management on the costs of the construction as some said that waste management did not have implication, while the others said the contrary. There was some additional cost involved in recycling construction material waste and sometimes it depends on the kind of waste and the procedure of the waste management.

## SUMMARY OF DISCUSSION

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| **1.** | To examine the knowledge of the contractors of green construction. | A. Awareness of the Green Construction. | In WIJAYA KARYA company: the five responded have heard about the green construction term.<br><br>In PEMBANGUNAN PERUMAHAN company: three of five they Heard about the green construction, and they Gave example such as how to save energy during constructional works.<br><br>In HUTAMA KARYA company three of the responded they Know about the green construction and .Gave example such their constructional works that protect environment. But the other two not yet hear about it.<br><br>In WASKITA KARYA company: the five responded they Heard about this term and they Gave example as open space, parks, home, building concepts, and garden.<br><br>In ADI KARYA three of four responded they Heard about the green construction and Gave example the development of city parks, but one of them not yet heard about that. | The respondent has good knowledge about the term of green construction but they still need educate to give them enough knowledge about this term. |  <br>  |

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| | | | | |  |
| | | B. The Definition of Green Construction | In WIJAYA KARYA company all of the five responded definite the green construction as Construction which use efficient energy, material, waste, and product to improve their process for more sustainable environmental in the future.<br><br>Is opportunity to use resources efficiently while creating healthier building.<br><br>In PEMBANGUNAN PERUMAHAN company: all of the three responded they given definition for green construction is building construction that uses less energy, conserve renewable resources, and reduce toxic of used materials.<br><br>In HUTAMA KARYA: three of five responded the definite the green construction as Continuous environment prevention during constructional period. but the other two can't give definition<br><br>In WASKITA KARYA company: all of the five responded they definite the green construction as environmentally friendly concept and application which provide | | |

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| | | | benefits, functions, and other added values to the area.<br><br>In ADI KARYA the three responded they give definition is construction that conserving the environment. But one of them not gives. | | |
| | | C. The Benefits of Green Construction | In WIJAYA KARYA company: all of the five responded they Gives example as energy efficiency, water efficiency, and material efficiency.<br><br>In PEMBANGUNAN PERUMAHAN: all of the three responded answers as Decreasing the cost and minimizing the healthy risk.<br><br>In HUTAMA KARYA: all of three the responded they mentioned some benefits such as Gives balance ecosystem and environment.<br><br>In WASKITA KARY, all of the five responded they given answer as. Minimizing negative impacts during project implementation, and To maintain environment sustainability.<br><br>In ADI KARYA: all of the five responded said Keep clean and cool environment without any damage to the surrounding | | |

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| | | | environment. | | |
| **2**. | To identify the policy of the contractors in terms of green construction. | A. Existence of the Policy to Promote Green Construction | In WIJAYA KARYA: all of the five responded mentioned the policy of there company as By reducing waste, conserve energy and resources, and reduce air, soil, and water pollution.<br><br>In PEMBANGUNAN PERUMAHAN: the three responded answers as The fixing of environment management on building construction to increase environmental life quality.<br><br>In HUTAMA KARYA all of the five responded answers as applying ecology friendly program.<br><br>In WASKITA KARYA: two of the responded said not sure, but the others three said yes saving the energy.<br><br>In ADI KARYA: three of the responded given answer as Provisioning garden decoration when the construction. But the other one doesn't answer. | There are policy In each company they must be do it in detail to go toward the green construction | |
| | | B. The Measures which can be used for the Application | In WIJAYAKARYA company: four of five responded answer as. Reducing materials which can damage environment and | | |

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| | | of Green Construction | Applying method of operation which doesn't disturb the natural balance. But the other one not give answer.<br><br>In PEMBANGUNAN PERUMAHAN company: two of the responded said Environmentally safety and healthy performance that is evaluated every month. But the third one doesn't answer.<br><br>In HUTAMA KARYA: two of the responded said no, but the other three said Doesn't destroy environmental impairment. And Applying good waste management.<br><br>In WASKITA KARYA: three of the responded answer as Do not know. But the other two said using environmentally friendly material.<br><br>In ADI KARYA: three of the responded answer as Maintaining the cleanliness, also Make small gardens around the project, And Held meetings in the morning with the whole community hall project workers. | | |

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| **3.** | To recognise the contractors' application of green construction including the process | A. The Reduce in Materials Usage | In WIJAYA KARYA: all of the five responded said yes, Innovate new way for more efficient and better materials and Reduce the amount of materials going to landfills.<br><br>In PEMBANGUNAN PERUMAHAN: two of three responded said as: Do stocking the wood with one measurement for any pieces and Decreasing of cutting unnecessary wood. But the other one doesn't answer.<br><br>HUTAMA KARYA: all of the responded answer as we Don't reduce the material that vrolotes the specification.<br><br>In WASKITA KARYA: three of the responded answer as Be more efficient with all materials. But the other two said no<br><br>In ADI KARYA: two of four responded answer as Utilizing the waste project at best to minimize the using of new materials. but the other two doesn't answer | When the respondent said we reuse and recycle the materials so in this case they can handle the waste and also the lower the project energy in the site in effect this the must important thing absolutely after they got the knowledge. |  |

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| | | B. Contractors' Materials Reuse | In WIJAYA KARYA: all of the responded answer as yes. Reuse wood materials from Solo's project.<br><br>In PEMBANGUNAN PERUMAHAN company: two of three responded said, Plan accurately the using of wood. But the other one doesn't answer.<br><br>In HUTAMA KARYA: three of the responded answer as: Reusing transformation bar and collect waste reinforcement. But the other two said no.<br><br>In WASKITA KARYA company: three of the responded answer As: Take advantage of the woods which are still good enough. But the other one have no answer<br><br>In ADI KARYA: three of the responded give answer as: Utilizing biggest wood which is still feasible in use. But the other one doesn't answer. | |  |

| No. | Objectives | indicator | Respondents | Comment | Pictures |
|---|---|---|---|---|---|
| | | C. Recycling of the Materials Waste | In WIJAYA KARYA: the all five responded answer as: Reuse steel waste to build/ make another structure.<br><br>In PEMBANGUNAN PERUMAHAN: two of the responded answer as Bigger cut of wood will be used for other things, such chair, desk, or part of roof. But the other one doesn't answer<br><br>In HUTAMA KARYA: four of the responded said NO. but one of them said according with the specification<br><br>In WASKITA KARYA: three of the responded answer as: Do not know. But the other two said yes, for some use able materials. Wood of concrete<br><br>In ADI KARYA: two of the responded said Selling unused materials to buy new ones. but the other two doesn't answer | | |

# CHAPTER 6

# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Conclusions

The conclusions from this research are as follow:

1. The contractors surveyed in this study did not have the same level of knowledge regarding the green construction concept. Of the five contractors in this study, three had a good knowledge about the green construction, while the other two did not. The respondents were aware of the "green construction" concept. They viewed this concept as the means to creating greenery and environmentally friendly projects. The respondents also stated their opinion that the contractors must be concerned with "green construction" issues, because this kind of construction will help build more sustainable environment and create comfort. In this case, more education for the contractors on this issue is needed. The contractors need to know all of the information related with the green construction so that they can understand the benefits of the green construction, and hence applying it in their operation.
2. The contractors have also followed environmental standard policy and used the operational method which does not disturb the natural balance. The government should give the motivation to the responded to go green, the contractors' policy to follow green concept and regulations can lead to the creation of a healthy, convenient, and pollution-free environment which is good for the atmosphere. The responded mention some kind of policy such as by reducing waste, conserve energy and resources, and reduce air, soil, and water pollution. The best practices in waste reduction options for recycling, reducing, or reusing solid waste products, and

creating healthy working environment and considering environment impact in every working activity.

3. All of the contractors taking part in this study had already put the application of green construction in their construction process based on their respective company policies. The respondents also mentioned some steps to lower the project's energy such as using water and electricity wisely, writing in every room warning sticker about energy saving like 'turn light off during daylight' and building offices with many windows so that light can come in and electricity usage can be economized. According to the majority of the respondents green construction was resources efficient, because it uses waste material which in turn will reduce cost and save money in construction process. The respondents also identified lowering cost of the construction budget as the best approach to promote green construction and supported the idea that local incentives will help build momentum for green building development. In the process of green construction. The responded mention the method to reuse and recycle waste material and the selection of the materials used in green construction. Recycling waste materials can be done by recycling the stone, metal, and other products that are non-toxic, reusable and renewable.

## 6.2 Recommendation

As air pollution and carbon footprint increases are also caused by the construction and operation of a building, construction project can become the solution to protect the future generations from environmental catastrophe. The recommendations that contractors have to follow are represented in the following points:

1. The contractors with less knowledge of the green construction need to increase their knowledge on the matter so that they can improve their work in relation to this issue.
2. The contractors need to adjust their policy in green construction according to the international standard, and should the government give the motivation to the responded to go green.
3. The contractors should continue their green construction practice they have already had in construction, such as reusing and recycling waste.

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## Appendix

***I. Profile of respondents***

What is your position in the company?

Experience ……years

***II. Knowledge of green construction***

Q1. Have you heard about green construction? Can you give example?

Q2. Can you Give definition of green construction?

Q3. What are the benefits of green construction?

Q4. What do you do to promote 'green construction'? Give example?

Q5. What are obstacles in promoting green construction in the project?

Q6. Are you aware of any green construction in Semarang? Could you describe?

Q7.should contractors be concerned with green issues? Why?

***III. Policy of green construction***

Q8. Is there are policy in your company to promote green construction? If yes, what the policy?

Q9. Are there any measures can be used for the application of green construction? What is that?

***VI .Application of green construction***

Q10. Is the green construction expensive? Why?

Q11. Is there any standard operating procedure in your company to promote green construction? Could you describe?

Q12. What do you know about Leadership in Energy and Environmental Design?

Q13. What do you know about Green Building Council Indonesia?

Q14. Is it possible to spread the application of the idea of green construction in Semarang? If yes how?

Q15. Do you have any experience about the green construction? Could you describe that?

Q16. What example projects are currently being used to promote green construction in Semarang city?

Q17. If you are a project manager, with a mandate, how to lower your project's energy consumption?

Q18. Are the Green construction resources efficient? Give the reasons?

Q19. Have you developed property in a city that currently offers or has offered incentives for green building at the time of your project? Could you explain?

Q20. Which cities offered or are offering you incentives for green development?

Q21. What is the form of the incentives?

Q22.what incentives would be the most significant for contractors to develop green construction projects?

Q23. In your experience, what is the most compelling approach to consider building green aside from government or client requirement?

Q24. Please give one brief reason why you think local incentives will help build momentum for green building development?

***V. The process of green construction***

Q25.Are all the materials used in green construction are available here in Semarang? Give example?

Q26. Do you reduce your materials? How?

Q27. Do you reuse your materials? Give example?

Q28. Do you recycle your waste of materials? Give example? How?

Q29. How do you select materials for the project?

Q30.How do you manage handle waste in the construction process?

Q31. Does the waste management have financial implication on costs of the construction?

| ***Wijaya Karya*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q1. Have you heard about green construction? Can you give example? | yes ,I have .green building construction | Yes, I can. | yes | yes | yes | All staff in this company they have knowledge about green construction |
| Q2. Can you Give definition of green construction? | Green contraction are construction which use efficient energy, material, west and product to improve their process for more sustainable environmental in the future. Green is opportunity to use resources efficiently while creating healthier building. it provides cost saving to all and through improved human health and productivity, lower cost building operations, and resource efficiency to a sustainable future. | Definition of green construction is the structure and process of building environmentally responsible. | green construction is a structure and using process that is environmentally responsible. | Refer to a structure and using process that is environmentally responsible and resource efficient throughout a building life-cycle. | Construction based on environmentally responsibility . | The majority of the responded in this company they given the definition for the green construction is a structure and using process that is environmentally responsible and resource efficient throughout a building life-cycle. And which use efficient energy, materials, west and product to improve their process for more sustainable environmental in the future.. |

| ***Wijaya Karya*** | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q3. What are the benefits of green construction? | Green construction could improve quality of the product and lower the budget of construction process. | Water efficiency, material efficiency and energy efficiency. | energy efficiency, water efficiency, material efficiency | Energy efficiency, material efficiency and water efficiency. | Energy efficiency. | For this question all the staff gives answer as efficiency, material efficiency and energy efficiency. |
| Q4. What do you do to promote 'green construction'? Give example? | by minimize waste and use recycle product. Include lumber, dry well, metals, masonry (brick, concrete,etc),carpt, plastic, pipe ,rocks,paper,cardboard,or green waste related to land development. | Reducing material of damage environment, method of operation which doesn't disturb the natural balance. | reducing material of damage environment | Reduce material witch can damage environment, method of operation which doesn't disturb the natural balance. | Reduce material can damage environment al. | most of the staff in this company they said ,reduce material can damage environmental, method of operation which doesn't disturb the natural balance, |

| ***Wijaya Karya*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q5. What are obstacles in promoting green construction in the project? | Understanding of project personnel to perform the material saving in the construction and management of construction waste. | Material, reuse, cost design. | material , design cost rules, urban planning | Cost, design. Material, rules, urban and planning. | Cost, design. | Most of the responded in this company they said, cost, design, reuse, Material, rules, urban and planning, |
| Q6. Are you aware of any green construction in Semarang? Could you describe? | no answer | yes, I'm green construction will create region environmentally friendly | yes, green construction will create a region that it occupied the eara which green and environmentally friendly. | yes, green construction will create a rogion that it occupied the area which is green and environmentally and friendly. | Yes. | Most of the responded said yes we are green construction will create a region that it occupied the area which green and environmentally friendly. |

| ***Wijaya Karya*** | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q7.should contractors be concerned with green issues? Why? | Yes, because it's potential to contribute to a more sustainable built environment. As sustainability continues to evolve from a traditional culture term to a practical way to build, more innovations will surface that will allow building owners to seamlessly track control their energy usage. | yes it should because it difficult to be realize | yes, but maybe difficult to realize | yes, but maybe difficult to realize | yes, but maybe difficult to realize | Most of the responded said yes but difficult to realize |
| Q8. Is there are policy in your company to promote green construction? If yes, what the policy? | Yes, there is. By reducing waste, conserve energy and resources, and reduce air, soil, and water pollution. The best practices in waste reduction options for recycling, reducing, or reusing solid waste products. | yes, recycle material | Yes, recycle material (ex, wood) reduce water and + electricity and paper usage. | yes, recycle material ex. Wood, reduce water, electricity, paper usage | yes, recycle material | All the staff said yes, there is by recycled material (ex, wood) reduce water and electricity and paper usage. And reducing waste, conserve energy and resource. |

| *Wijaya Karya* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q9. Are there any measures can be used for the application of green construction? What is that? | no answer | reducing material of damage environment | reducing material of damage environment | Reduce material witch can damage environment, method of operation which doesn't disturb the natural balance. | Method of operation which doesn't disturb the natural balance. | The majority of the staff said, reduces material which can damage environment, method of operation which doesn't disturb the natural balance. |
| Q10. Is the green construction expensive? Why? | No. by minimize waste and use recycle product it means lower cost. | yes, because cost to hire expert people in green building | Yes cost to hire expert people in green building, initial investment to start it . | Yes cost to hire expert people in green building, initial investment to start it . | yes cost to hire expert people in green building | The majority of the responded said, yes cost to hire expert people in green building , initial investment to start it . |

| *Wijaya Karya* | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q11. Is there any standard operating procedure in your company to promote green construction? Could you describe? | Yes, for environmental project we have environmental standard operating procedure. | yes, always using recycle material | yes, always using recycle material work methods, which doesn't produce waste above the tolerable units | yes, always using recycle material work methods, which doesn't produce waste above the tolerable units | no idea | The majority of the contractor said, yes, always using recycle material work methods, which doesn't produce waste above the tolerable units.. |
| Q12. What do you know about Leadership in Energy and Environmental Design? | LEED is an internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies intended to improve performance in metrics such as energy savings, water efficiency. CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. | no I don't | I don't think anything | No idea | No idea | The majority of the responded said, we don't know. |

| ***Wijaya Karya*** | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q13. What do you know about Green Building Council Indonesia? | Green building council institute Indonesia or Indonesia green building council is an independent(non government) and nonprofit (non-for profit) that is fully committed to the education community in applying best practices to facilitate the reansformation of the environmental and sustainable global construction industry. GBC Indonesia is emerging member of the world green building council (WGBC) based on Toronto, Canada. WGBC currently has 73 countries and has only the GBC in each country. | no I don't | No, I don't know | No idea | I don't know | The majority of the staff said, we don't know . |
| Q14. Is it possible to spread the application of the idea of green construction in Semarang? If yes | no answer | Yes, but depend on the people and government policy. | Yes, depend on the people and government. | yes, depend on the people and government | Yes, but depend on the people policy. | The majority of the staff said, yes, but depends on the people and government policy. |

| *Wijaya Karya* | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| how? | | | | | | |
| Q15. Do you have any experience about the green construction? Could you describe that? | Yes. In ache project, Indonesia. "Turbidty curain" one of the challenges in construction related to these water environmental issues. Pollution is a problem that often the case in the Bridge project and Roads, because direct contact with water. One of our project example, on the embankment works. this area can cause pollution in the river, caused soil easily washed away by water. this can disturpt river ecosystems. The river and also human often use a river water for daily life. so also at the time of erection work, oil spills and other hazardous materials can contaminate the river water, it is necessary in making a | yes I do , paragon city Semarang project u ti lization of land for waste water treatment | Yes, I do. Paragon city Semarang. | paragon city Semarang project, S T P building, utillzation to land for waste water treatment. | Paragon city. Semarang | All the staff said, yes, paragon city Semarang project, S T P building, |

| ***Wijaya Karya*** | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| | protection to localize this river water pollution. WIKA on USAID projects have also been implemented for protection against this water pollution. tools for pollution procurement of " turbidity curtain" of the standard fee will be very expensive, therefore the project team perform innovation by making "turbidity curain", adjusted with existing material field, yet not reduce function from " turbidity curtain" itself. | | | | | |

| ***Wijaya Karya*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q16. What example projects are currently being used to promote green construction in Semarang city? | Kaligarang project | paragon city Semarang | Yes, I do. Paragon city Semarang. | paragon city Semarang project, S T P building, utilization to land for waste water treatment | Paragon city. Semarang | The majority of the responded said, paragon city Semarang project, and Kaligarang project. |
| 17. If you are a project manager, with a mandate, how to lower your project's energy consumption? | By reducing energy consummation by with the use of energy-efficient equipment and counter working hours for working in an efficient appliance. | using water and electricity wisely | using the tools accordance with the time and it function using water and electricity wisely | using the tools accordance with the time and it function using water and electricity wisely | Using water and electricity, wisely. | The majority of the responded said, using the tools according with the time and it function using water and electricity wisely, |

| ***Wijaya Karya*** | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q18. Are the Green construction resources efficient? Give the reasons? | Yes, because reducing waste can save you money in construction process. | Yes, because it using waste material which can reduce cost. | yes, because it using waste material can reduce cost | yes, because it using waste material can reduce cost | yes, because it using waste material which can reduce cost | The majority of the responded said, yes, because it using waste material which can reduce cost. |
| Q19. Have you developed property in a city that currently offers or has offered incentives for green building at the time of your project? Could you explain? | no answer | No, I don't have any idea. | No idea | No idea | No I haven't | All the staff said, we have no idea about that. |
| Q20. Which cities offered or are offering you incentives for green development? | Jakarta | No idea | No idea | No idea | No idea | All the staff said, we have no idea about that. |

| ***Wijaya Karya*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q21. What is the form of the incentives? | no answer | No, I don't know | I don't know | I don't know | don't know | All the contractors said, we have no idea about that. |
| Q22.what incentives would be the most significant for contractors to develop green construction projects? | no answer | No, I don't know | I don't know | I don't know | don't know | All the staff said, we have no idea about that. |
| Q23. In your experience, what is the most compelling approach to consider building green aside from government or client requirement? | in our experience the lower cost of the construction budget as the benefit of green construction is more interest than any other approach | No idea | No idea | No idea | No idea | All the responded said, we have no idea about that. |

| ***Wijaya Karya*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q24. Please give one brief reason why you think local incentives will help build momentum for green building development? | no answer | No idea | No idea | No idea | No idea | All the responded said, we have no idea about that. |
| Q25.Are all the materials used in green construction are available here in Semarang? Give example? | no answer | No idea | yes hebel, (citycon) | yes hebel, (citycon) brick replacement material that is more environmentally friendly | yes, hebel | Most of the responded said, yes, hebel, (citycon) brick replacement material that is more environmentally friendly |

| ***Wijaya Karya*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q26. Do you reduce your materials? How? | in our company culture we used to find efficient method "invation" which could find new way for more efficient materials but has same or better quality. During the construction phase, one goal should be to reduce the amount of material going to landfills. Well-designed buildings also help reduce the amount of waste generated by the occupants as well ,by providing on-site solutions such as compost bins to reduce matter going to landfills. | yes, it is use heble , so it can reduce PC usage | yes it is use hebel so it can use PC usage | yes, it use heble, so it can reduce PC usage | yes, it is use hebel so it can reduce PC usage | Most of the staff said, yes, it is use hebel so it can reduce PC usage. |

| *Wijaya Karya* | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q27. Do you reuse your materials? Give example? | Yes, I do green construction also seeks to reduce waste of energy, water and materials used during construction. Deconstruction is a method of harvesting what is commonly considered “waste" and reclaiming it into useful material. Extending the useful life of a structure also reduces waste- building materials such as wood that are light and easy to work with make renovations easier. | yes, wood material, reuse from solo's project | yes, wood material, reuse from solo's project | yes, wood material reuse from solo's project. | yes, wood material | most of the staff said, yes, wood material reuse from solo's project, |
| Q28. Do you recycle your waste of materials? Give example? How? | recycled stone, recycled meral, and other products that are non-toxic, reusable, renewable, and/or recyclable(e.g. Trass, Linoleum, sheep wool, panels made from paper flakes, compressed earth block, adobe, baked earth, rammed | Yes, use steel waste to build. | Yes, use steel waste to build. | yes, use steel waste to build/ make another structure (ex. Stairs) | yes, use steel waste to build/ make another structure | most of the staff said, yes, yes, use steel waste to build/ make another structure (ex. Stairs) |

| *Wijaya Karya* | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| | earth, clay, vermiculite, flax linen, sisal, sea grass, cork, expanded clay grains, coconut, wood fiber plates, calcium sand stone, concrete(high and ultra high performance, roman self-healing concrete). we suggest using recycled industrial goods, such as coal combustion products, foundry sand, and demolition debris in construction projects. the foundation of any construction project is rooted in the concept and design. the concept stage, in fact, is one of the major steps in a project life cycle, as it has the largest impact on cost and performance. in designing environmentally optimal buildings, the objective is to minimize the total environment impact | | | | | |

| *Wijaya Karya* | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| | associated with all life-cycle stages of the building project. however, building as a process is not as streamlined as industrial process, and varies from one building to the other, never repeating itself identically. in addition, buildings are much more complex products, composed of a multitude of materials and components each constituting various design variables to be decided at the design stage. A variation of every design variable may affect the environment during all the building's relevant life-cycle stages. so we have model which can use for other project. | | | | | |

| ***Wijaya Karya*** | | | | | | |
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| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q29. How do you select materials for the project? | We use materials that are available locally. A similar concept is natural building, which is usually on a smaller scale and tends to focus on the use natural materials. | material which contain in work and term of condition | material which contain in work and terms of condition | material which contain in work and terms of condition | material which contain in work and terms of condition | The majority of the responded said that we use the material which contain in work and terms of condition, |
| Q30.How do you manage handle waste in the construction process? | Construction waste recycling is the separation and recycling of recoverable waste materials generated during construction and remodeling. Packaging, new material scraps and old materials and debris all constitute potentially recoverable materials. In renovation, appliances, masonry materials, doors and windows are recyclable. The initial step in a construction waste reduction strategy is good planning. Design should be based on standard sizes and | those material that can still be used | choose material that can still be used | Choose material that can be still used, but in separate place that can easy to use it. | choose material that can still be used | The majority of the staff said that, choose material that can be still used, but in separate place that can easy to use it . |

| *Wijaya Karya* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| | materials should be ordered accurately. Additionally, using high quality materials such as engineered products reduces rejects. This approach can reduce the amount of material needing to be recycled and bolster profitability and economy for the builder and customer. | | | | | |

| ***Wijaya Karya*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q31. Does the waste management have financial implication on costs of the construction? | Yes. There is some additional cost involved in recycling constructing material waste until an established procedure is developed. Cost saving are also realized through the efficient design and use of materials minimizing waste however, transportation costs and the lack of local companies using recycled resources make recycling of many materials that are not directly reusable too expensive to be feasible at the present time. | No | No | No | No | The majority of the staff said that, No, |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q1. Have you heard about green construction? Can you give example? | yes, I heard | Yes. During construction how to save energy | Yes. Change common construction material, such as wood replace with the other, maybe steel pipes or fiber plastic | | | the majority of the responded said that ,yes |
| Q2. Can you Give definition of green construction? | Green building means the building construction that uses less energy, conserve renewable resources and reduce toxic material used. | contractor concern with environmental how the contractor reduce | construction or build something with environment mind set, to reduce pollution of water, air and keep sustainability of trees, soil and etc. | | | most of the responded they give different definition for green construction is green building means the building construction that use less energy, conserve renewable resources and reduce toxic material used. Or construction or build something with environment mind set, to reduce pollution of water, air and keep sustainability of trees, soil and etc. |
| Q3. What are the benefits of green construction? | Energy efficiency and reduce cost. | can be get healthy environment | In large aspect, we will decrease our cost and minimize our healthy risk. | | | In large aspect, we will decrease our cost and maximize our healthy risk, and using energy efficiency. |

| PP | | | | | | |
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| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q4. What do you do to promote 'green construction'? Give example? | For example a simple way, plant some trees around my project. | No answer | Carry on our company environment standard in the projects. | | | Some of the responded said for example a simple way, plant some trees around my project. and carry on our company environmental standards in the projects |
| Q5. What are obstacles in promoting green construction in the project? | behavior from some people to act as what green construction should do | need special budget | the obstacle is about our employ habit's such as smoking during working time | | | Behavior from some people to act as what green construction should do, need special budget, the obstacle is about our employ habits such as smoking during working time. |
| Q6. Are you aware of any green construction in Semarang? Could you describe? | Yes I'm, planting some trees to reduce air conditioner used in project. | No answer | Yes, my project always aware of green construction, by change formwork material from wood replace with steel or fiber material | | | all of the staff said, yes I'm, planting more trees to reduce air conditioner used in project. And by change formwork material from wood replace with steel or fiber material. |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q7.should contractors be concerned with green issues? Why? | It should be. Because this is the way to stop global warming. | Yes, to develop area need construction | Yes, in short period, it will decrease project expenditure, in long period, it will safe our environment from destruction. | | | most of the staff said ,Yes, in short period, it will decrease project expenditure , in long period , it will safe our environment from destruction. |
| Q8. Is there are policy in your company to promote green construction? If yes, what the policy? | Yes, creating healthy working environment and considering environment impact in every working activity. | Yes. Healthy environment in the work place | Yes, the policy is about how to fix environment management on building construction in order to increase environmental life quality. | | | Most of the staff said, yes, the policy is about how to fix environment management on building construction in order to increase environmental life quality, and creating healthy working environment. |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q9. Are there any measures can be used for the application of green construction? What is that? | Yes we have environmental performance and safety and health performance that will be evaluated every month. | No answer | Yes, we have environment standard policy. Including subject and object that is measured. | | | Most of the staff said, yes, we have environmental standard policy. Including subject and object that is measured and safety and health performance that will be evaluated every month. |
| Q10. Is the green construction expensive? Why? | No, it isn't. Because every one can applied it in every place they work. | Yes, all equipment should require no noise and soon | in early time maybe quite expensive, but in the next time it will be cheap, because every material and equipment can be reuse | | | The responded give different answers for example; Yes, it isn't. Because every one can applied it in every place they work. And the last one said, in early time maybe quite expensive, but in the next time it will be cheap, because every material and equipment can be reuse. |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q11. Is there any standard operating procedure in your company to promote green construction? Could you describe? | Yes. It is. Every worker has to clean places they work at before leaving. | Yes. If we used generator, should be the silent type | Yes, we have green construction company policy…Green construction target…Implementation guidance…Monthly assessment | | | The majority of the responded said, yes, it is. Every worker have to clean places they work at before leaving and If we used generator, should be the silent type, and Green construction target…Implementation guidance…Monthly assessment. |
| Q12. What do you know about Leadership in Energy and Environmental Design? | To be a leader in every green construction based on green building. | No answer | How to create building with low energy consumption such as electrical design. Door and window design in reference to full fill green building standard. | | | The majority of the responded give the definition is to be a leader in every green construction based on green building and how to create building with low energy consumption such as electrical design. Door and window design in reference to full fill green building standard. |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q13. What do you know about Green Building Council Indonesia? | it's a non governmental organization, not profit, to applied green principal in planning, construction and operation of building | Dinas lingkungan hidup | get commitment to designing and applying the green principles in the design and achieve what supposed to be a green building standard. It is not merely a trend, it has to be a lifestyle change, the demand of the consumer of a "green" living environment meets the planet current conditions, climate change and degrading environmental conditions. | | | The staff give definition is get commitment to designing and applying the green principles in the design and achieve what supposed to be a green building standard. It is not merely a trend, it has to be a lifestyle change, and the demand of the consumer of a "green" living environment meets the planet current conditions, climate change and degrading environmental conditions. And it's a non governmental organization, not private, to applied green principal in planning. |

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|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q14. Is it possible to spread the application of the idea of green construction in Semarang? If yes how? | yes | Yes. We can a plicate gradually. Little by little | Yes, by doing simple things such as change material that produce from wood, replace with steel that can be reuse. | | | All the staff said, yes, by doing simple things such as change material that produce from wood, replace with steel that can be reuse and applicant gradually, Little by little. |
| Q15. Do you have any experience about the green construction? Could you describe that? | Yes I do, build a hospital with balancing in trees building. | Yes. Reduce using wood material | Yes, now in my project still improve many things that can make our project more aware environment. We make biopori for water absorpsion. | | | The majority of the staff said, yes, we do, build a hospital with balancing in trees building, and reduce using wood material, and we make biopori for water absorption. |
| Q16. What example projects are currently being used to promote green construction in Semarang city? | undip | BPK project | BPK project in pudakpayung Semarang. | | | The majority of the staff they give example as; BPK project in pudakpayung Semarang. |

| PP | | | | | | |
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| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| | | | | | | |
| Q17. If you are a project manager, with a mandate, how to lower your project's energy consumption? | Minimized electricity consumption with maximized nature resources. | Gas, Coal | By reduce electrical consumption (lamp, water, pump, etc), reduce gasoline consumption. | | | The majority of the staff they said, Minimized electricity consumption with maximized nature resources. |
| Q18. Are the Green construction resources efficient? Give the reasons? | Yes they are. | No. material price is expensive | Yes, because can reduce cost of operational and fabrication. | | | Most of the staff they said, Yes, because can reduce cost of operational and fabrication, |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q19. Have you developed property in a city that currently offers or has offered incentives for green building at the time of your project? Could you explain? | Yes | No answer | Can't answer | | | One of the staff they not give answers, |
| Q20. Which cities offered or are offering you incentives for green development? | Semarang | No answer | Can't answer | | | the staff they not give answers, |
| Q21. What is the form of the incentives? | a lot of windows to decrease electricity consumotion | No answer | Can't answer | | | One of the responded he said, a lot of windows to decrease electricity consumption, but the other they not give answers, |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q22.what incentives would be the most significant for contractors to develop green construction projects? | reduce cost | No answer | Can't answer | | | The responded they not give answers. |
| Q23. In your experience, what is the most compelling approach to consider building green aside from government or client requirement? | Mostly from clint requirement. | Before construction, should be required green material. | Can't answer | | | Two of the responded they said, before construction, should be required green material, and mostly from Clint requirement. |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q24. Please give one brief reason why you think local incentives will help build momentum for green building development? | Awareness from human resources to reduce glopal warming. | Should be supported by other parties, especially government. | Can't answer | | | Two of the responded they said, should be supported by other parties, especially government, and awareness from human resources to reduce global warming. |
| Q25.Are all the materials used in green construction are available here in Semarang? Give example? | mostly available in semarang,for example wood, roof, plastic | Yes. Steel | | | | Tow of the responded he said, yes, mostly available in Semarang, for example wood, roof, plastic, and steel. |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q26. Do you reduce your materials? How? | yes I do ,for example wood. I will stock it with one measurement for any pieces. Decrease cut another wood. | Yes. In panel formwork we change the wood frame with steel hollow | | | | Tow of the responded he said, yes, we do, for example wood. I will stock it with one measurement for any pieces. Decrease cut another wood, and in panel formwork we change the wood frame with steel hollow.. |
| Q27. Do you reuse your materials? Give example? | Yes I do. Planning with accurate to use wood for | mostly use steel than wood | | | | Tow of the staff he said, yes, mostly, planning with accurate to use steel than wood. |
| Q28. Do you recycle your waste of materials? Give example? How? | Yes I do. Bigger cut of wood will used for other things. Like chair, desk or part of roof. | Yes. use another side of paper | | | | Two of the staff said, yes, we do. Bigger cut of wood will used for another things, like chair, desk or part of roof, or use another side of paper. |

| PP | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | SUMMARY |
| Q29. How do you select materials for the project? | selecting it by spec, measurement , kind , and used for | use recycling material | | | | Two of the staff said, selecting it by spec, measurement, kind, and used for. And use recycling material. |
| Q30.How do you manage handle waste in the construction process? | Stock it on the place that prepared to collect that waste. | store in different place, depend the waste material | | | | Two of the staff said, store it on the place that prepared to collect that waste and store in different place, depend the waste material. |
| Q31. Does the waste management have financial implication on costs of the construction? | of course yes. | Yes | | | | Two of the staff said, of course yes. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q1. Have you heard about green construction? Can you give example? | Yes, like saving energy building simple. Example you must turn off light or air conditioning when not in use | not yet | not yet | Already. Contractor that to prevent environment | Yes, contractor that to protect environment. | The responded said yes, Contractor that to protect environment and like saving energy building. |
| Q2. Can you Give definition of green construction? | may be green construction is like construction building that do not polluted the environment | No I can't | no I can't | the contractor during construction period always to prevent environmentally | built and save earth | The staff they give different definition like, may be green construction is like construction building that do not polluted the environment and save earth, or the contractor during construction period always to prevent environmentally. |
| Q3. What are the benefits of green construction? | more energy efficient | environment ’s balance | environmental consideration | balance environment/ecosystem | balance ecosystem | All of the staff they give different benefits like, more energy efficient, environmental consideration, balance environment, balance ecosystem. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q4. What do you do to promote 'green construction'? Give example? | turn off the light when not in use, dispose of waste according to its place | no idea | no idea | the effort doesn't destroyed environmentally | we built and save earth | three of the staff they give different answers, like, turn off the light when not in use, dispose of waste according to its place ,the effort doesn't destroyed environmentally, we built and save earth. |
| Q5. What are obstacles in promoting green construction in the project? | habits of the people project | cost and time | cost | not yet all person are understanding of green construction | not all person know that | three of the responded they give different answers, like, habits of the people project, cost and time. |
| Q6. Are you aware of any green construction in Semarang? Could you describe? | No answer | I don't think so | I don't think so | Yes. Planting out tree | yes, we plant some three | all of the responded they not give answers, |
| Q7.should contractors be concerned with green issues? Why? | Because can reduce pollution the environment | yes | yes | Yes. So doesn't destroyed environment. | Yes, to save our earth. | All of the staff they said, yes, because can reduce pollution the environment, and doesn't destroyed it, and to save our earth. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q8. Is there are policy in your company to promote green construction? If yes, what the policy? | Yes. Every year we must | Yes. To plant 1 million tree | yes. To plant 1 million tree | Available. With eco-friendly's program. | Yes, there are. With ecology friendly program. | All of the responded they said, yes, there are. With ecology friendly program every year. |
| Q9. Are there any measures can be used for the application of green construction? What is that? | I think if polluted can reduce the program mean success. | NO | no | Doesn't destroy environmental impairment. With good manage wastes. | No. because only some trees and more discipline our job for ecology friendly. | all of the responded they said, No, |
| Q10. Is the green construction expensive? Why? | No. more efficient if the habits of those already formed | YES | Yes. Any treatment should do | Are not. Because not yet familiar. | No | two of the responded they said ,No |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q11. Is there any standard operating procedure in your company to promote green construction? Could you describe? | Not yet, just advise | I DON'T KNOW | I don't know | ISO 14000 | ISO14000 | The majority of the responded they don't know. |
| Q12. What do you know about Leadership in Energy and Environmental Design? | I Don't know | I DON'T KNOW | I don't know | yes | No | Most of the staff they don't know about that. |
| Q13. What do you know about Green Building Council Indonesia? | may be environment department | I DON'T KNOW | I don't know | I haven't known | No | Most of the staff they don't know about that. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q14. Is it possible to spread the application of the idea of green construction in Semarang? If yes how? | spread brosure | Yes is it government policy | yes it is possible by governme nt decrees | yes. So its environment becomes green | yes, so it become green | Most of the contractors they said, yes it is possible by government decrease and spread brochure. |
| Q15. Do you have any experience about the green construction? Could you describe that? | I Don't know | No | no | Yes, with separated waste. | yes, with sepazled rubbish | Most of the staff they said, No |
| Q16. What example projects are currently being used to promote green construction in Semarang city? | I Don't know, you can ask to environment department | I DON'T KNOW | I don't know | Planting of tree and waste management. | Planting some threes and waste management. | Most of the responded they said, we don't know. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q17. If you are a project manager, with a mandate, how to lower your project's energy consumption? | I will write in every room warning sticker about energy saving. | turn light off during daylight | I'm turn light off during daylight | Office is made there are many windows so light can come in so gets to economize electricity. | office is made there are many windows | all of the staff they said , we will write in every room warning sticker about energy saving like turn light off during daylight and office is made there are many windows so light can come in so gets to economize electricity. |
| Q18. Are the Green construction resources efficient? Give the reasons? | Yes. We can efficient electric energy | I DON'T KNOW | I don't know | yes. With electric energy cut back therefore will down cost. | yes | The majority of the staff they said, yes, we can efficient electric energy, so it cut back therefore will down cost. |
| Q19. Have you developed property in a city that currently offers or has offered incentives for green building at the time of your project? Could you explain? | I Don't know | Not yet | not yet | not yet . | Not yet | All of the responded they said, no |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q20. Which cities offered or are offering you incentives for green development? | I Don't know | I DON'T KNOW | I don't know | not yet | Not yet | All the responded not answer this question. |
| Q21. What is the form of the incentives? | not yet exist | No answer | No answer | not yet available | Not yet | All the responded not answer this question. |
| Q22.what incentives would be the most significant for contractors to develop green construction projects? | I Don't know | No answer | No answer | not yet available | Not yet | All the responded not answer this question. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q23. In your experience, what is the most compelling approach to consider building green aside from government or client requirement? | I Don't know | No answer | no answer | nothing | No | All the staff not answers this question. |
| Q24. Please give one brief reason why you think local incentives will help build momentum for green building development? | I Don't know | No answer | no answer | Because the incentives one of motivation for going green building. | yes, for motivation | All of the staff they said not answer. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q25.Are all the materials used in green construction are available here in Semarang? Give example? | No answer | I DON'T KNOW | I don't know | no. | No | All of the staff they said. No answer. |
| Q26. Do you reduce your materials? How? | we don't reduce the material its vrolotes the specification | No I didn’t reduce the material | no, I don't reduces the material | no . Because material which is provided accordance with the specification. | No | All of the contractor they, said, we don't reduce the material because material which is provided accordance with the specification. |
| Q27. Do you reuse your materials? Give example? | Reuse may be permitted, we use transformation bar again and collect waste reinforcement | Yes , formwork | Yes. Formwork | no | No | Most of the contractor they, said, yes, Reuse may be permitted; we use transformation bar again and collect waste reinforcement and formwork. |

| ***HUTAMA KARYA*** | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q28. Do you recycle your waste of materials? Give example? How? | yes we recycle but long story | No | No | No | according with the specification | Two of the staff they, said No |
| Q29. How do you select materials for the project? | specification building have existing | the cheapest one | the cheapest one | According with the specification. | According with the specification. | All of the responded they, said, according with the specification. |
| Q30.How do you manage handle waste in the construction process? | we separate the dry and wet gaubage, chemical waste, atc | No answer | no answer | waste was be grouping by B3 and non B3 | be grouping | Three of the staff they, said, we separate the dry and wet garbage, chemical waste, and waste was be grouping by B3 and non B3 atc.. |
| Q31. Does the waste management have financial implication on costs of the construction? | not much cost | Yes | Yes | Yes | yes, we dose | Most of the staff they, said yes, |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q1. Have you heard about green construction? Can you give example? | yes, a building that using garden in the roof top. Minimalize the using of air conditioner. I think thoose can be categorized for green construction. | yes. Construction that care of environment. | Ever. Examples: open space, parks, home and building concepts or applications garden, park roads and roadside median, central park. | Yes. Building construction. | Ever. Construction management without causing negative effects on the environment, use of natural materials that do not result in negative or environmentally friendly. | All the staff said, yes, Examples: open space, parks, home and building concepts or applications garden. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q2. Can you Give definition of green construction? | Construction that use less of electricity for the operational, using material that can be recycle. Etc | green construction is a construction method , work that care more to environment | Construction with the concept and application of environmentally friendly, and provide added value in an area with the functions and benefits such construction. | Considering construction or minimize environmental damage or to minimize energy usage. | Process design, construction and pre construction environmentally friendly. | All the responded give a definition is, Construction with the concept and application of environmentally friendly, and provide added value in an area with the functions and benefits such construction. Using material that can be recycling, to minimize energy usage... Etc |
| Q3. What are the benefits of green construction? | For long term, we can reduce cost for maintenance participates to keep the nature resource. | More care to environment and less of damage. | Preserving nature. Reduce global warming. Reduce air pollution. Providing a beautiful view. Provide space for recreation. | Preserve the green environment. | Minimize negative impacts during project implementation and to maintain environmental sustainability. | All of the responded they give different benefits like, Preserving nature, Reduce global warming, Reduce air pollution, Providing a beautiful view, Provide space for recreation, more care to environment and less of damage, and to maintain environmental sustainability. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q4. What do you do to promote ‘green construction’? Give example? | using material that can be recycle | Promote to save the energy, plant trees along the damage construction area. | Applies construction design with the surrounding park. | Protect nature from global warming. | Keeping construction equipment in a state that does not cause environmental damage such as maintaining low levels of pollution. | All of the responded they said, using material that can be recycle ,promote to save the energy, plant trees along the damage construction area, Applies construction design with the surrounding park, Keeping construction equipment in a state that does not cause environmental damage such as maintaining low levels of pollution. |
| Q5. What are obstacles in promoting green construction in the project? | Creating green space for the public long the project. | budget, low understands of "green" | Has no authority. Clashed with the regulations. | Planting trees at the project site. | High cost and difficult implementation. | All of the staff they give different reasons like, budget, and low understands of "green”, Has no authority. Clashed with the regulations, planting trees at the project site, High cost and difficult implementation. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q6. Are you aware of any green construction in Semarang? Could you describe? | No project in Semarang can be categorized for green construction. | I don't find any | Median park road. Park Young monument. Aalun - the town square. Roadside park. | Yes. In the housing sidomukti with the concept of a minimalist home with a green environment. | No | most of the staff they said, No |
| Q7.should contractors be concerned with green issues? Why? | Yes, to keep the nature clean. | Yes, because construction usually damage the nature. | Because it is important for survival. | Yes. Because the contractor is one of the elements of the community face to face with permasalan "removing" green line. | Must. To get the project easier because the indirect promotion of the implementation of green construction. | all of the staff they said, Yes, with different reasons, Because the contractor is one of the elements of the community face to face with permasalan "removing" green line, To get the project easier because the indirect promotion of the implementation of green construction and because construction usually damage the nature. Because it is important for survival. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q8. Is there are policy in your company to promote green construction? If yes, what the policy? | not sure | Yes, saving the the energy. | Do not know | Yes. No items in the contract for re-planting trees. | There | Most of the staff they said, yes, there is, saving the energy. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q9. Are there any measures can be used for the application of green construction? What is that? | no answer | No | Do not know | Minimize cutting of trees. Conserve energy. Environmentally friendly design. | Periodic inspection of environmental conditions. Perecanaan using environmentally friendly material. Construction Pelakasaan more to see whether it will disrupt the natural conditions around. | most of the responded said, Do not know |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q10. Is the green construction expensive? Why? | Expensive, because in a project we must concern about cash flow. company always want more income, etc | Yes and no.. Because it depends on the method and field situation | No. Because green building is necessary to maintain the natural balance and many benefits. | No. In Indonesia, cheap and fertile plants. | Yes. Because the material used is not common. | The responded give different answers like, Yes. Because the material used is not common. Expensive, because in a project we must concern about cash flow, company always want more income, etc and the others said, No. Because green building is necessary to maintain the natural balance and many benefits, |
| Q11. Is there any standard operating procedure in your company to promote green construction? Could you describe? | I'm not sure if there any. | no | Do not know | Yes exist. SOP depending on the project contractor. | There. Periodic inspection of the environment. | Most of the responded they said, don't know. |
| Q12. What do you know about | nope | it's about the concern of | Restrict the use of energy. | No answer | Do not know | Most of the responded they said, don't know. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Leadership in Energy and Environmental Design? | | design that care of nature and less damage | Building construction by considering the environmental aspect. | | | |
| Q13. What do you know about Green Building Council Indonesia? | nope | Yes, it is. By building awareness to the construction company, students, and campus. | Do not know | No answer | Do not know | The majority of the staff they have no idea about that, |
| Q14. Is it possible to spread the application of the idea of green construction in Semarang? If yes how? | not sure | in this company, I don't have. | Implementing regulations in local legislation. | Yes. In collaboration with government agencies, universities to disseminate the need for "go green" | Can. By creating a media campaign or green construction. | The majority of the staff they Yes. In collaboration with government agencies, universities to disseminate the need for "go green" and to Implementing regulations in local legislation or by creating a media campaign or green construction. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q15. Do you have any experience about the green construction? Could you describe that? | no | I don't have any idea of current project in Semarang. | Manufacture home park housing. Making residential street park | No | Yes | The majority of the staff they said no, |
| Q16. What example projects are currently being used to promote green construction in Semarang city? | not sure | | Making parks along the city streets. | sidomukti housing. Project gawe times. Jatibaran dam | No | Some of the responded give example |
| Q17. If you are a project manager, with a mandate, how to lower your project's energy consumption? | minimalized the use of electrical equipment. | make arule and build awareness of saving energy and use low energy electricity product | Enforce regulations on energy saving all employees. | Make use of air conditioning schedule. Efficient lighting. | No | Most of the responded they said make a rule and build awareness of saving energy and use low energy electricity product. For example make use of air conditioning schedule. Efficient lighting. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q18. Are the Green construction resources efficient? Give the reasons? | I think so. Because the source of material can be renew | depent | Yes. Because it can be enjoyed by all people and preserving nature | Yes. Because it can save energy. | Do not understand. | Some of the responded they said, yes, because it can be enjoyed by all people and preserving nature, save energy and the source of material can be renew |
| Q19. Have you developed property in a city that currently offers or has offered incentives for green building at the time of your project? Could you explain? | I haven't chance to develop. | no | No answer | No answer | No | Most of the responded not give answer. |
| Q20. Which cities offered or are offering you incentives for green development? | I don't know | no tities | No answer | semarang. Jepara, holy (Muria region) | I don't know | Most of the staff not gives answer. |
| Q21. What is the form of the incentives? | no answer | no idea | No answer | Given a free tree seedlings. | No answer | Most of the staff not gives answer. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q22.what incentives would be the most significant for contractors to develop green construction projects? | Reward from government. | no idea | Tidal responsibility | Award given to contractors who cares "go green" | No answer | Some of the staff they said, Award given to contractors who cares "go green", reward from government |
| Q23. In your experience, what is the most compelling approach to consider building green aside from government or client requirement? | no answer | awareness of nature | Lifestyle to be a trend in the present and future. That green building is very helpful and have aesthetic value. | minimalize cost (overhead) | Marketing | Most of the staff they said, marketing, minimize cost (overhead), Lifestyle to be a trend in the present and future. Those green buildings are very helpful and have aesthetic value and awareness of nature. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q24. Please give one brief reason why you think local incentives will help build momentum for green building development? | no answer | to challenge movement of green building development. | Because it was one culture that should be a green building is built with full awareness. For all parties | Because Indonesian politics has shifted towards the local autonomy so that the areas most have a role in regional development planning. | No answer | most of the responded they said ,Because Indonesian politics has shifted towards the local autonomy so that the areas most have a role in regional development planning, to challenge movement of green building development. |
| Q25.Are all the materials used in green construction are available here in Semarang? Give example? | I don't know | yes, green materials are available everywhere, it depent on the use of materials. | Available. That is the seller of plants and garden-making material. | Yes. Substitute wood house with light production of steel. | Not the same | Most of the responded they said, yes, green materials are available everywhere, it depend on the use of materials, that is the seller of plants and garden-making material, and Substitute wood house with light production of steel. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q26. Do you reduce your materials? How? | no. all material must fix with the contruct. | yes, be more efficients with all materials | Yes. For savings. | Planning optimization of materials. | No | Most of the staff they said, yes, are more efficient with all materials, and for savings. |
| Q27. Do you reuse your materials? Give example? | yes, formwork for concrete work. | yes, for some woods, usually reuse for other | Yes. Take advantage of the wood is still proper to use again. | A base camp of the material used (contry Sery) | No | Most of the responded they said, yes, formwork for concrete work, Take advantage of the wood is still proper to use again. |
| Q28. Do you recycle your waste of materials? Give example? How? | yes, leaves recycle into fertilizer. | yes, for some use able materials. Wood of concrete | Do not know | Do not know. | No | Most of the responded they said, don't know. |

| *WASKITA KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questionners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q29. How do you select materials for the project? | material that fulfill the requirement of project. | depend on the oudget, quality and production area( prefer to choose the close to the project) | Specification and existing funds | In accordance with contract specifications. | No | Most of the responded they said, depend on the budget, quality and production area (prefer to choose the close to the project), material that full fill the requirement of project and Specification and existing funds. |
| Q30.How do you manage handle waste in the construction process? | separate the chemical, recycle, etc | Separate the waste of construction, build green construction method. | Working with waste management company. | In accordance with SOP K3 LM project (HSE) | No | Most of the staff they said, separate the waste of construction, build green construction method, and separate the chemical, recycle, working with waste management company and In accordance with SOP K3 LM project (HSE). |
| Q31. Does the waste management have financial implication on costs of the construction? | no answer | depend on kind of waste and the procedure of the waste management, | No. Because only a few waste management approval of the project value. | Yes | No | Most of the staff they said, no. Because only a few waste management approval of the project value. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q1. Have you heard about green construction? Can you give example? | Ever, construction of permanent construction with the advanced green atmosphere | Not yet | Yes, I have. | Yes ever. Development of city parks | | The majority of the responded they said, yes, and they give example, like, construction of permanent construction with the advanced green atmosphere, |
| Q2. Can you Give definition of green construction? | Construction that focuses on the beauty and comfort. | Not yet | Green construction is construction still conserving the environment. For example: construction that does not damage the surrounding environment | Any development there should be ¼ to greening | | the majority of the responded they given different answers, for example, Green construction is construction still conserving the environment and focuses on the beauty and comfort and Any development there should be ¼ to greening. For example: construction that does not damage the surrounding environment. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q3. What are the benefits of green construction? | Beauty and comfort. | Positive impact on the environment. | Keep clean and cool environment without any damage to the surrounding environment | Keep the environment clean and dirty air capture | | the majority of the staff they given different points of the benefits, Keep the environment clean and dirty air capture, environment without any damage to the surrounding environment, Positive impact on the environment, Beauty and comfort. |
| Q4. What do you do to promote 'green construction'? Give example? | Make a beauty. For example: planting trees at the project site. | NO answer | While maintaining the surrounding environment, to build a park in the vicinity of the project | With a banner containing the slogan about green construction. | | Three of the responded they give different answers, while maintaining the surrounding environment, to build a park in the vicinity of the project, and Make a beauty. For example: planting trees at the project site |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q5. What are obstacles in promoting green construction in the project? | Usually, the problem is funding. Because contractors rarely make budget at the tender process. | Dispose of waste in place. | Funding constraints fairly and quickly damaged by the project activity | Major cost constraints and can be easily damaged | | The majority of the responded they give different answers, Major cost constraints and can be easily damaged, Funding constraints fairly and quickly damaged by the project activity, Dispose of waste in place, and usually, the problem is funding. Because contractors rarely make budget at the tender process. |
| Q6. Are you aware of any green construction in Semarang? Could you describe? | No answer | no | Yes. Such as a garden city | Development is the city park which is on a working government Semarang. | | Some of the responded are aware about the green construction. . |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q7.should contractors are concerned with green issues? Why? | Because green is identical with the beauty and comfort. | no comment | Should care. To reduce pollution and green environmental change due to development projects. | Mandatory. For the environment is always clean and cool. | | The majority of responded they said, yes. To reduce pollution and green environmental change due to development projects, and also because green is identical with the beauty and comfort. |
| Q8. Is there are policy in your company to promote green construction? If yes, what the policy? | Yes there is, for example provision of garden decoration when the construction. | I don't understand. | There. Still hold K3 where inside there is a green environmental conservation programs around the project. | There. Often held clean - clean environment projects | | the majority of responded they give different answers, like, Yes there is, for example provision of garden decoration when the construction, Still hold K3 where inside there is a green environmental conservation programs around the project and Often held clean - clean environment projects. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q9. Are there any measures can be used for the application of green construction? What is that? | There. Construction involving K3 officer makes a beauty by planting trees around the Development. | I don't understand. | While maintaining the cleanliness and make a small garden around the project. | Often held meetings in the morning with the whole community / project workers | | The majority of responded they said, There are. Construction involving K3 officer makes a beauty by planting trees around the Development, while maintaining the cleanliness and make a small garden around the project and often held meetings in the morning with the whole community / project workers. |
| Q10. Is the green construction expensive? Why? | Dependent. Usually in the tender there was no budget for it, so that the contractor makes a separate budget. | may be. | Expensive. Because they have to increase construction costs beyond. | Do not know yet. | | Some of the staff said its expensive |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q11. Is there any standard operating procedure in your company to promote green construction? Could you describe? | There are standard operations. I know it's included in the task K3 | I don't know. | While maintaining the cleanliness and beauty in the vicinity of the project. | No. answer | | Some of the responded they said, There are standard |
| Q12. What do you know about Leadership in Energy and Environmental Design? | No answer | I don't know. | No answer | Do not know yet | | All of the staff they not given answers for this question. |
| Q13. What do you know about Green Building Council Indonesia? | No answer | I don't know. | Development considering the beauty and cleanliness of the environment. | I don't know | | the responded they not given answers |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q14. Is it possible to spread the application of the idea of green construction in Semarang? If yes how? | No answer | I don't know. | Impossible. Need a big budget. | Possible. With emphasis on building city parks | | The responded said no idea. |
| Q15. Do you have any experience about the green construction? Could you describe that? | Not yet | I don't know. | Yes. In every project I do always keep the environment and protecting the environment around. | Not yet | | One of the responded he said, yes. In every project I do always keep the environment and protecting the environment around. But the others said no idea. |
| Q16. What example projects are currently being used to promote green construction in Semarang city? | No answer | I don't know. | proyek City Park | Many projects such as the current city park renovation project in the city park at the intersection of five. | | Some of the responded they given an example. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q17. If you are a project manager, with a mandate, how to lower your project's energy consumption? | No answer | I don't know. | Use of waste materials properly. | By utilizing the waste with a maximum project | | Some of the responded they said, by utilizing the waste with a maximum project, Use of waste materials properly. |
| Q18. Are the Green construction resources efficient? Give the reasons? | No answer | I don't know. | To function very well. But if you look very big budget required. | Depending on project funding. | | Some of the responded they have no idea, |
| Q19. Have you developed property in a city that currently offers or has offered incentives for green building at the time of your project? Could you explain? | No answer | I don't know. | Does not exist. Because there is no budget to build green and usually only make a small garden around it. | Do not know | | All of the responded they said not exist. Because there is no budget to build green and usually only make a small garden around it. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q20. Which cities offered or are offering you incentives for green development? | No answer | I don’t know. | No | I have some incentive | | All of the satff they don't answer the question, but one of them said, I have some incentive. |
| Q21. What is the form of the incentives? | No answer | No answer. | No | Form of food and extra money | | All of the staff they don't answer the question, but one of them said, Form of food and extra money. |
| Q22.what incentives would be the most significant for contractors to develop green construction projects? | No answer | NO answer | Usually in the form of overtime pay. | Do not know | | All of the staff they don't answer the question, but one of them said, Usually in the form of overtime pay. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q23. In your experience, what is the most compelling approach to consider building green aside from government or client requirement? | Own initiative with green building. | No answer | Approach is the advantage. | Benefits of green building | | Most of the responded they Benefits of green building, Approach is the advantage, and Own initiative with green building. |
| Q24. Please give one brief reason why you think local incentives will help build momentum for green building development? | No answer | No answer | No answer | Yes incentive is a reward for the performance of workers. | | the responded they said, No |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q25.Are all the materials used in green construction are available here in Semarang? Give example? | No answer | No answer | Almost everything there. begesting boards using materials such as wood, so can be explained if not in use anymore. | I do not know | | Most of the responded they said, No answer, |
| Q26. Do you reduce your materials? How? | No | No answer | Yes. Utilize the remaining material with a maximum. | By utilizing the waste project in the best - well that can reduce the use of new materials. | | Some of the staff they said, by utilizing the waste project in the best - well that can reduce the use of new materials. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q27. Do you reuse your materials? Give example? | Yes. Most natural stone, soil, etc. | No answer | Yes. We always use the rest of the building materials to the next. | Yes. Utilizing begesting wood that is still feasible in use. | | Most of the staff they said, yes. Utilizing begesting wood that is still feasible in use and we always use the rest of the building materials to the next, so most natural stone, soil, etc. |
| Q28. Do you recycle your waste of materials? Give example? How? | No answer | No answer | Yes. Materials that are not in use I sell then I bought a new material. | Yes. Sell waste and waste results buy new. | | Some of the responded they said, yes. We recycle the Materials that are not in use |
| Q29. How do you select materials for the project? | Materials for the project we are looking for technical requirements specification. | No answer | According to specifications and according to color. | Quality, quantity, number 1, but at competitive prices | | Most of the responded they said, we select the Materials According to specifications. |

| *ADI KARYA* | | | | | | |
|---|---|---|---|---|---|---|
| *questioners* | R1 | R2 | R3 | R4 | R5 | summary |
| Q30.How do you manage handle waste in the construction process? | We distinguish waste into the waste which is still used, we use more and waste disposal. | No answer | By selling the remaining construction materials. | The baker, sold, or in storage. | | The majority of the responded they said, we distinguish waste into the waste which is still used. |
| Q31. Does the waste management have financial implication on costs of the construction? | Yes. Of course. Because it can help efficiency. | No answer | Yes. Sure. Need funds to process waste and waste disposal mobilization that can not be recycled. | Yes of course. Waste treatment requires manpower that must be paid. | | The majority of the responded said Yes |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| Q1. Have you heard about green construction? Can you give example? | Most of respondents said that they have knowledge about green construction | Most of respondents in this company they yes we have knowledge about green construction | Most of The respondents said yes we already heard about this term | Most of The responded said yes we already heard about the green construction term | Most of respondents in this company they yes we have knowledge about green construction |
| Q2. Can you Give definition of green construction? | Refer to a structure and using process that is environmentally responsible and resource efficient throughout a building life-cycle. | Green building means the building construction that uses less energy, conserve renewable resources and reduce toxic material used. | The green construction is like construction building that do not polluted the environment | Considering construction or minimize environmental damage or to minimize energy usage. And construction environmentally friendly. | Green construction is construction still conserving the environment and focuses on the beauty and comfort. |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
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| Q3. What are the benefits of green construction? | Energy efficiency, material efficiency and water efficiency. | Energy efficiency, and will decrease our cost and minimize our healthy risk. | balance environment/ecosystem | Minimize negative impacts during project implementation and to maintain environmental sustainability | Keep clean and cool environment without any damage to the surrounding environment |
| Q4. What do you do to promote 'green construction'? Give example? | Reducing material of damage environment, method of operation which doesn't disturb the natural balance. | Carry on our company environment standard in the projects. | turn off the light when not in use, dispose of waste according to its place | Keeping construction equipment in a state that does not cause environmental damage such as maintaining low levels of pollution. | While maintaining the surrounding environment, to build a park in the vicinity of the project |
| Q5. What are obstacles in promoting | material , design cost rules, urban | behavior from some people to act as what green | cost and time | High cost and difficult implementation | Major cost constraints and can be |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
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| green construction in the project? | planning | construction should do | | because low understands of "green" | easily damaged |
| Q6. Are you aware of any green construction in Semarang? Could you describe? | The majority of the respondents said yes | The majority of respondents they said yes | Most of the respondents they don't know | Most of the respondents they said No | Some of the respondents are aware about the green construction. |
| Q7.should contractors be concerned with green issues? Why? | Most of the respondents they said Yes | Most of the respondents they Yes | The majority of the respondents they said Yes | Most of the respondents they said Yes | The majority of the respondents they said Yes |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| Q8. Is there are policy in your company to promote green construction? If yes, what the policy? | Most of the respondents they said “Yes” | The majority of the respondents they said Yes | Most of the respondents they said “Yes | Most of the respondents they promote the green construction. | Most of the respondents they said “Yes |
| Q9. Are there any measures can be used for the application of green construction? What is that? | Reduce material witch can damage environment, method of operation which doesn't disturb the natural balance. | The respondents they said Yes we have environmental performance and safety and health performance that will be evaluated every month. | Most of the respondents they said NO | Most of the respondents they said NO | There. Construction involving K3 officer makes a beauty by planting trees around the Development. |
| Q10. Is the green construction expensive? | The majority of the respondents they said Yes cost to hire expert people in | Most of the respondents they said Yes | The Majority of the respondents they said No | Most of the respondents they said Yes | Some of the respondents said that “its expensive |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| Why? | green building, initial investment to start it. | | | | |
| Q11. Is there any standard operating procedure in your company to promote green construction? Could you describe? | Most of the respondents they yes, always using recycle material work methods, which doesn't produce waste above the tolerable units | Most of the respondents they said Yes, we have green construction company policy…Green construction target…Implementation guidance…Monthly assessment | Most of the respondents they said they don't know | Most of the respondents they said we Do not know | Some of the respondents they said, There are standard |
| Q12. What do you know about Leadership in Energy and Environmental | Most of the respondents they have No idea | How to create building with low energy consumption such as electrical | Most of the respondents they said we Don't know | Most of the respondents they Do not know | Most of the respondents they Don't know. |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
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| Design? | | design. Door and window design in reference to full fill green building standard. | | | |
| Q13. What do you know about Green Building Council Indonesia? | Most respondents they do not know | it's a non governmental organization, not profit, to applied green principal in planning, construction and operation of building | Most of the respondents they Don't know. | Most of the respondents they Don't know. | Most of the respondents they Don't know. |
| Q14. Is it possible to spread the application of the idea of | Some of the respondents they said Yes but depend on the people and | Most of the respondents they said Yes, by doing simple things such as | Most of the respondents they said Yes it is government policy | Most of the respondents they No | Most of the respondents they have No idea |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
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| green construction in Semarang? If yes how? | government policy. | change material that produce from wood, replace with steel that can be reuse. | | | |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| Q15. Do you have any experience about the green construction? Could you describe that? | Most of the respondents they said Yes, It is .Paragon city Semarang. | Most of the respondents they said Yes | Most of the respondents they said No | Most of the respondents they said No | Most of the respondents they said we Don't know |
| Q16. What example projects are currently being used to promote green construction in Semarang city? | Most of the respondents they said paragon city Semarang | BPK project in pudakpayung Semarang. | Most of the respondents they said we Don't know | Some of the responded give example | Some of the responded they given an example. |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| Q17. If you are a project manager, with a mandate, how to lower your project's energy consumption? | using the tools accordance with the time and it function using water and electricity wisely | By reduce electrical consumption (lamp, water, pump, etc), reduce gasoline consumption | office is made there are many windows so light can come in so gets to economize electricity | make a rule and build awareness of saving energy and use low energy electricity product | Some of the responded they said, by utilizing the waste with a maximum project, Use of waste materials properly. |
| Q18. Are the Green construction resources efficient? Give the reasons? | Yes, because it using waste material which can reduce cost. | Yes, because can reduce cost of operational and fabrication. | Don't know | Yes | Some of the responded they have no idea, |
| Q19. Have you developed property in a city that currently offers or has offered incentives for green building at the time of your project? Could | Most of the respondents they have No idea | Most of the respondents they give No answer | Most of the respondents they Don't know | Majority of the respondents they give No answer | Most of they respondents they Do not know |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| you explain? | | | | | |
| Q20. Which cities offered or are offering you incentives for green development? | Most of the respondents they have No idea | Most of the respondents they give No answer | Most of the respondents they Don't know | Most of the respondents they Don't know | Most of the respondents they Don't know |
| Q21. What is the form of the incentives? | Most of the respondents they Don't know | Most of the respondents they give No answer | Most of the respondents they give No answer | Most of the respondents they give No answer | Most of the respondents they give No answer |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| Q22.what incentives would be the most significant for contractors to develop | Most of the respondents they Don't | Most of the respondents they give No answer | Most of the respondents they give | Award given to contractors who cares "go | Most of the respondents they Don't |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| green construction projects? | know | | No answer | green" | know |
| Q23. In your experience, what is the most compelling approach to consider building green aside from government or client requirement? | Most of the respondents they have No idea | Before construction, should be required green material. | Most of the respondents they give No answer | Lifestyle to be a trend in the present and future. That green building is very helpful and has aesthetic value. | Most of the responded they Benefits of green building, Approach is the advantage, and Own initiative with green building. |
| Q24. Please give one brief reason why you think local incentives will help build momentum for green building development? | Most of the respondents they have No idea | Awareness from human resources to reduce global warming. | Most of the respondents they Don't know | To challenge movement of green building development. | Most of the respondents they give No answer |
| Q25.Are all the materials used in green construction are | Most of the respondents they said yes | mostly available in Semarang, for example wood, roof, plastic and | Most of the respondents they give | Most of the respondents | Most of the respondents they give No |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| available here in Semarang? Give example? | hebel, (citycon) brick replacement material that is more environmentally friendly | steel | No answer | they said Yes | answer |
| Q26. Do you reduce your materials? How? | Majority of the respondents they said Yes, it use heble, so it can reduce PC usage | Yes I do, for example wood. I will stock it with one measurement for any pieces. Decrease cut another wood. | Most of the respondents they said No | Most of the respondents they said Yes | Some of the staff they said, by utilizing the waste project in the best - well that can reduce the use of new materials. |
| Q27. Do you reuse your materials? Give example? | Most of the respondents they said Yes, wood material, reuse from | Most of the respondents they said Yes | Most of the respondents they said Yes | Most of the respondents they said Yes | Most of the respondents they said Yes |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| | solo's project | | | | |
| Q28. Do you recycle your waste of materials? Give example? How? | Yes, use steel waste to build. | Most of the respondents they said Yes | Most of the respondents they said No | Most of the respondents they Don't know | Some of the responded they said, yes. We recycle the Materials that are not in use |

| Questions | WIJAYA KARYA | PEMBANGUNAN PERUMAHAN | HUTAMA KARYA | WASKITA KARYA | ADI KARYA |
|---|---|---|---|---|---|
| Q29. How do you select materials for the project? | material which contain in work and terms of condition | selecting it by spec, measurement , kind , and used for | according with the specification | Accordance with contract specifications. | Most of the responded they said, we select the Materials According to specifications |
| Q30.How do you manage handle waste in the construction process? | Choose material that can be still used, but in separate place that can easy to | stock it on the place that prepared to collect that waste | we separate the dry and wet gaubage, chemical waste, atc | Separate the waste of construction, build green construction method. | The majority of the responded they said, we distinguish waste into the waste which is still used.. |
| Q31. Does the waste management have financial implication on costs of the construction? | Most of the respondents they said No | Most of the respondents they said Yes | Most of the respondents they said Yes | Most of the respondents they said No | Most of the respondents they said Yes |